# REPORT OF THE FOREST SERVICE

## FISCAL YEAR 1991

100 Years of Conservation 1891-1991

1891•1991

National Forests Centennial Celebration

United States Department of Agriculture • Forest Service

# USDA - FOREST SERVICE

The Forest Service, U.S. Department of Agriculture, provides leadership in the management, protection, and use of the Nation's forests and rangelands. The agency operates under the concept of multiple use, providing sustained yields of renewable resources such as water, forage, wildlife, wood and recreation. The Forest Service is committed to the preservation of wilderness, biodiversity, and landscape beauty as well as the protection of the basic resources of soil, water, and air quality in its management of these lands.

The Forest Service is responsible for the 191-million-acre National Forest System, with its 156 national forests and 19 grasslands in 42 States and Puerto Rico. In addition, the agency works with State land management organizations to help private landowners apply good natural resource management practices on their lands. The International Forestry arm of the Forest Service enables the agency to share its technical expertise and managerial skills with other nations. The Research arm of the Forest Service conducts extensive research to enhance and protect productivity on all of America's forests and rangelands, with special attention to long-term natural resource issues of national and international scope.

The management of the National Forest System is guided by the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended, and by the National Forest Management Act (NFMA) of 1976. Together, these laws encourage foresight in the use of the Nation's natural resources, and establish a long-range planning process for the management of the National Forest System. RPA focuses on the national long-range direction for natural resource conservation, while NFMA provides guidance on integrating the national direction with the planning and management for the National Forest System units.

## SELECTED FY 1991 STATISTICS

| | |
|---|---|
| **National Forest System** | **191 Million Acres** |
| **National Forest System Lands Burned** | **98 Thousand Acres** |
| **Insect and Disease Suppression** | **1.5 Million Acres** |
| **Wilderness** | **33.6 Million Acres** |
| **Watershed Improvements** | **35,091 Acres** |
| **Wildlife and Fish Habitat Improvements** | **486,538 Acres** |
| **Reforestation** | **503 Thousand Acres** |
| **Recreation Use** | **279 Million Visitor Days** |
| **Trail System** | **116,585 Miles** |
| **National Scenic Byways** | **4,900 Miles** |
| **National Wild and Scenic Rivers System** | **3,417 Miles** |
| **Livestock Grazing** | **9.5 Million Animal Unit Months** |
| **Grazing Allotments Administered** | **10 Thousand Permits** |
| **Mineral Cases Processed** | **25,349** |
| **Timber Sold** | **6.4 Billion Board Feet** |
| **Timber Harvested** | **8.5 Billion Board Feet** |
| **Road System** | **368 Thousand Miles** |
| **Woodland Owners Assisted** | **153,090** |
| **Research Publications** | **2,404** |
| **Permanent Full-time Employees** | **34,861** |
| **Human Resource Programs** | **134,620 Persons Served** |
| **Expenditures** | **$3.42 Billion** |
| **Receipts** | **$1.44 Billion** |

Cover: "Dawn of a new day," symbolic of the Forest Service's entry into a second century of leadership in natural resource conservation, and protection and management of the National Forest System.

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# FISCAL YEAR 1991


United States Department of Agriculture - Forest Service, Washington, DC

June 1992

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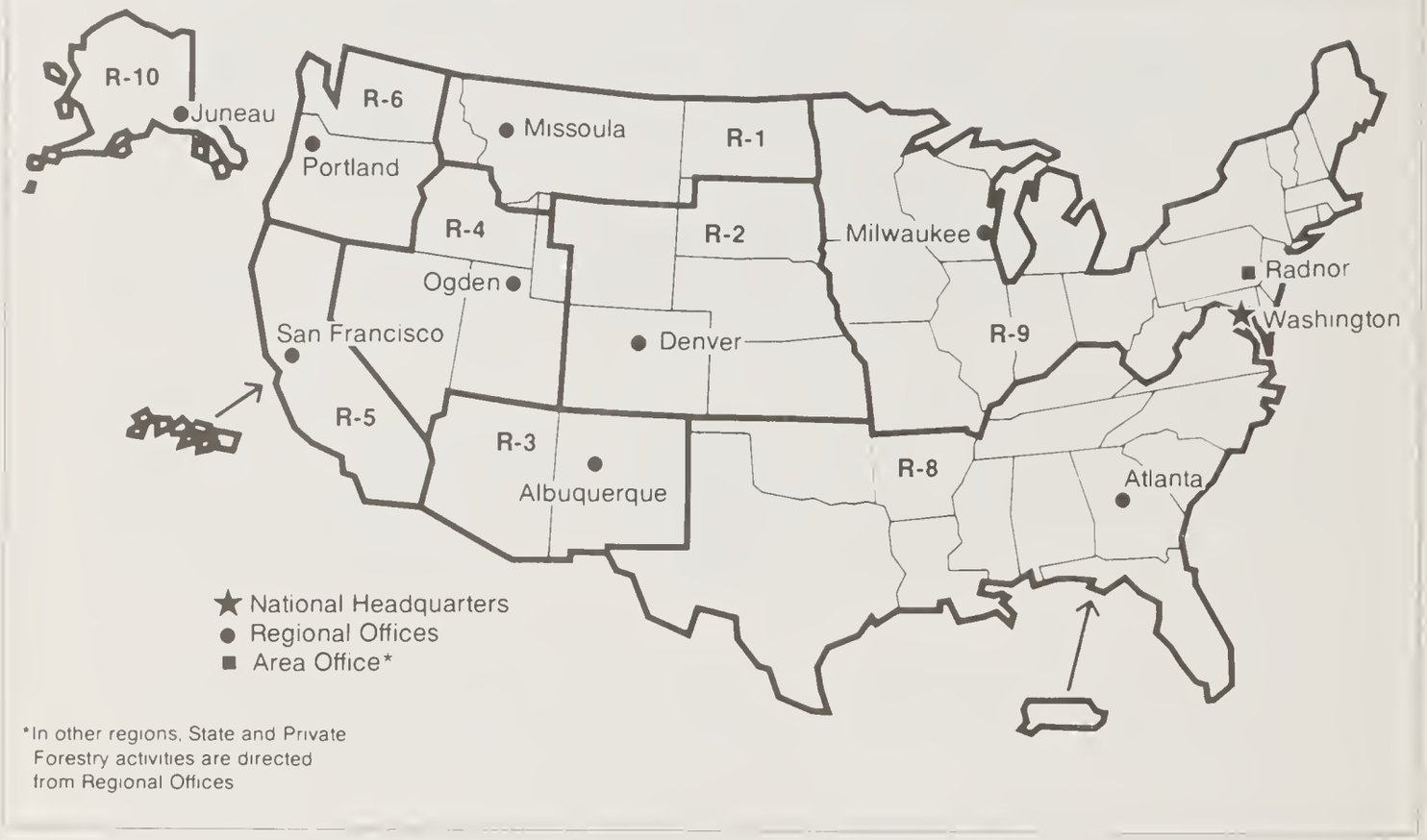
Figure 1.

**National Forest System Regional Offices**
**State and Private Forestry Area Office***




### Regional Offices

**Forest Service, USDA**
**Northern Region (R-1)**
Federal Building
P.O. Box 7669
Missoula, MT 59807
406-329-3511

**Forest Service, USDA**
**Rocky Mountain Region (R-2)**
11177 West 8th Avenue
P.O. Box 25127
Lakewood, CO 80225
303-236-9431

**Forest Service, USDA**
**Southwestern Region (R-3)**
Federal Building
517 Gold Avenue, S.W.
Albuquerque, NM 87102
505-842-3292

**Forest Service, USDA**
**Intermountain Region (R-4)**
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5352

**Forest Service, USDA**
**Pacific Southwest Region (R-5)**
630 Sansome Street
San Francisco, CA 94111
415-705-2870

**Forest Service, USDA**
**Pacific Northwest Region (R-6)**
333 S.W. 1st Avenue
P.O. Box 3623 (97208-3623)
Portland, OR 97204
503-326-2971

**Forest Service, USDA**
**Southern Region (R-8)**
1720 Peachtree Road, N.W.
Atlanta, GA 30367
404-347-2384

**Forest Service, USDA**
**Eastern Region (R-9)**
310 West Wisconsin Ave., Rm. 500
Milwaukee, WI 53203
414-297-3693

**Forest Service, USDA**
**Alaska Region (R-10)**
P.O. Box 21628
Juneau, AK 99802-1628
907-586-8863

### Area Office

**Forest Service, USDA**
**Northeastern Area—S&PF**
5 Radnor Corporate Center
100 Matsonford Rd., Suite 200
Radnor, PA 19087
215-975-4111

Figure 2.

**Research**


**National Headquarters**

Send all mail except Express Mail to this address:
Forest Service—USDA
14th & Independence Ave., S.W.
P.O. Box 96090
Washington, DC 20090-6090
202-205-1760

Send Express Mail and parcels to:
Chief, Forest Service
U.S. Department of Agriculture
14th & Independence Ave., S.W.
201 14th Street, S.W.
Washington, DC 20250

**Research Station Headquarters**

**Intermountain Forest and Range Experiment Station (INT)**
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5412

**North Central Forest Experiment Station (NC)**
1992 Folwell Avenue
St. Paul, MN 55108
612-649-5000

**Northeastern Forest Experiment Station (NE)**
P.O. Box 6775
5 Radnor Corporate Center
100 Matsonford Rd., Suite 200
Radnor, PA 19087
215-975-4222

**Pacific Northwest Forest and Range Experiment Station (PNW)**
P.O. Box 3890 (97208-3890)
333 S.W. 1st Avenue
Portland, OR 97204
503-326-5640

**Pacific Southwest Forest and Range Experiment Station (PSW)**
1960 Addison Street
P.O. Box 245 (94701)
Berkeley, CA 94704
415-486-3382

**Rocky Mountain Forest and Range Experiment Station (RM)**
240 West Prospect Road
Fort Collins, CO 80526-2098
303-498-1100

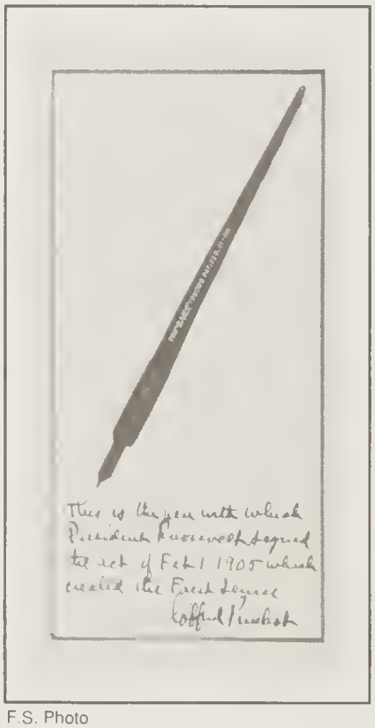
**Southeastern Forest Experiment Station (SE)**
200 Weaver Blvd.
P.O. Box 2680
Asheville, NC 28802
704-257-4390

**Southern Forest Experiment Station (SO)**
Room T-10210
U.S. Postal Service Building
701 Loyola Avenue
New Orleans, LA 70113
504-589-6800

**Forest Products Laboratory (FPL)**
One Gifford Pinchot Drive
Madison, WI 53705-2398
608-231-9200


*Secretary of Agriculture James T. Wilson.* F.S. Photo

*The Forest Service's Washington Office was in the U.S. Department of Agriculture's South Building (center) from 1940 until 1990 when it moved to the refurbished Auditors Building (lower right).* F.S. Photo




F.S. Photo

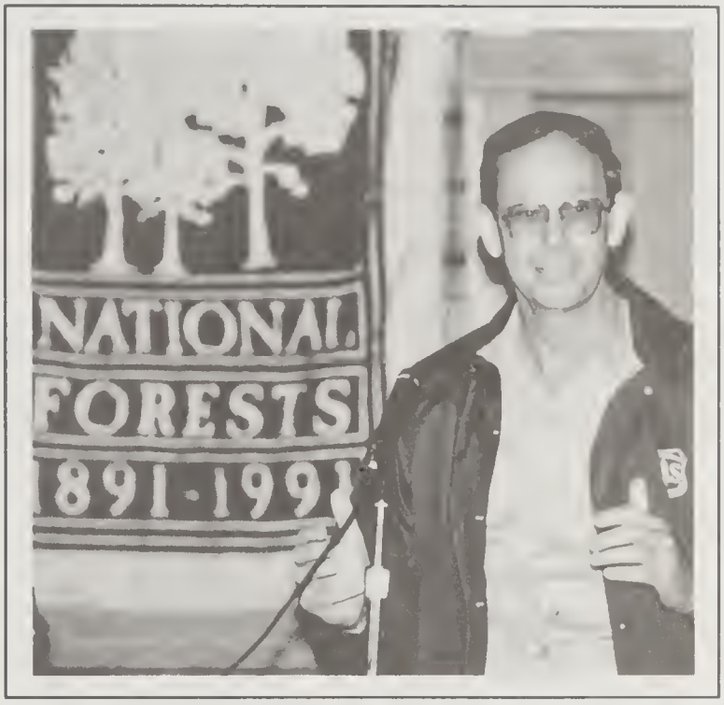
*President Harry S. Truman signing the proclamation to change the name of the Columbia National Forest to the Gifford Pinchot National Forest. Grandson Gifford Pinchot, III, looks on.* F.S. Photo

# Contents

*Forest Service Headquarters, Auditors Building, Washington, DC.* Photo by Jill Bauermeister

During fiscal year 1991, the Forest Service invited people everywhere to join in celebrating the centennial of conservation in the United States, a movement that resulted in the founding of the National Forest System in 1891. Centennial events throughout the year added the force of history to our commitment to the wise use of our Nation's resources. Echoes of the past enriched and reaffirmed our dedication to implement the best in current conservation practices — practices put forth by the Forest Service in our 1990 RPA Program, our New Perspectives philosophy, and the land management plans for our national forests and grasslands.

As we enter the second century of conservation in America, the Forest Service remains committed to managing public lands on a multiple-use basis. We exhibited this commitment during FY 1991 in our efforts to achieve a better balance among our resource management programs, our efforts to protect the long-term sustainability of the ecosystems we manage, and in our efforts to recognize the unique resource potential of each of the land units we manage. We also have a major responsibility to continue to strengthen the scientific base for natural resource management and provide this information to all landowners. The Forest Service continues to face the challenge of managing many uses in an environmentally acceptable manner, while simultaneously meeting the many demands on the Nation's forests and grasslands.




*Chief Dale Robertson addresses the National Forest Centennial Conservation Forum, on the Shoshone National Forest in Wyoming.*
F.S. Photo

As an integral part of the U.S. Department of Agriculture programs, the Forest Service continued in the forefront of four Presidential initiatives: recreation on the National Forest System; rural development; tropical forestry assistance; and tree planting on rural private lands and in urban areas and communities. All of these initiatives serve as key mechanisms for implementing the 1990 RPA Program.

During FY 1991, Forest Service management of the National Forest System improved in many ways. We strengthened our recreation, wildlife, and fisheries programs. We increased our efforts to protect sensitive, threatened, and endangered species and to promote their recovery. At the same time, we continued to make a major contribution to the Nation's economy and to the economic health of local communities through our output of timber, livestock grazing, minerals, and oil and gas.

The Forest Service conducted these management activities in collaboration with a broad array of partners in the private sector and at all levels of government. In many cases, these partners helped us improve the balance among the multiple uses of our forest and rangeland resources. They also helped us take important steps to increase the environmental sensitivity with which we deliver our programs.

During FY 1991, the Forest Service took steps to streamline and clarify the regulations for revising and amending forest plans. These new regulations are being designed to simplify the process for amending forest plans as new information about resource production and the condition of the national forests and grasslands becomes available.

The role of the Forest Service in world forestry expanded greatly during the year. Our horizons were extended, both by new statutory authority and by the Presidential initiative to provide forestry assistance in tropical countries and support for a global forestry agreement. The new authorities in international forestry built on the expertise we have to offer other countries, and provided increased opportunities to learn from others as experiences were shared. Our planet will need this kind of international cooperation and collaboration to meet the environmental and forestry challenges in the years ahead.

Forestry assistance on State and private lands was expanded through major new authorities contained in the 1990 farm bill. During FY 1991, the Forest Service moved rapidly to implement programs in urban and rural tree planting, stewardship incentives, rural development, forest health, and natural resource

conservation education. The President's tree planting and rural development initiatives clearly present opportunities for increased and strengthened resources for the future.

The Forest Service was involved in several significant scientific discoveries during the centennial year. For example, Forest Service scientists used state-of-the art genetic engineering that may help in the development of effective control methods for the gypsy moth, an approach much more environmentally benign than conventional control with insecticides. Research produced important advances in recycling, which significantly enhanced the potential for long-term energy savings and resulted in the development of new, superior paper and composite products.

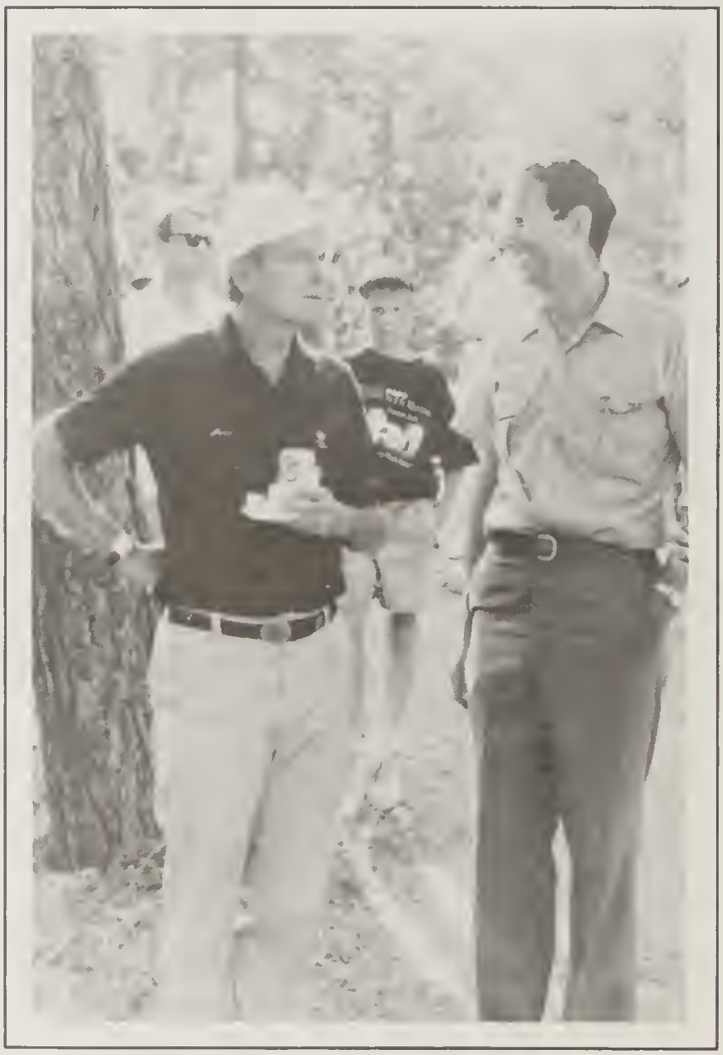
The Forest Service made major progress in the diversification of its work force during 1991. We developed a national Strategic Plan and took steps toward its implementation. These efforts enriched our understanding and appreciation of cultural diversity and strengthened our determination to ensure that Forest Service employees and all segments of our society continue to participate in the agency's mission to the fullest extent possible.

As we enter the second century of conservation in America, the Forest Service will retain its commitment to the important directions that have been charted in our long-term strategic vision: balanced multiple-use land management; environmentally acceptable commodity production; excellence in scientific research; contributions to the management of private forest land; and, responsiveness to global resource issues. The goal is to get more people involved and help even more of them participate in caring for the land, here and around the world.

F. Dale Robertson

F. DALE ROBERTSON
Chief

*President Theodore Roosevelt and Forest Service Chief Gifford Pinchot (circa 1907).* F S. Photo



*President George Bush and Forest Service Chief Dale Robertson.* F.S. Photo

*William Watts Hooper, Forest Supervisor of the Leadville National Forest in Colorado (circa 1905), with Mrs. Hooper. A veteran of the Civil War, Hooper started his career as forest ranger in 1898. His grandson and great-grandson also made careers with the Forest Service.*
F S. Photo

# Introduction

Photo by Ken Hammond

Photo by Yuen-Gi Yee

Photo by Ron Libby

Photo by Yuen-Gi Yee

## PURPOSE OF THE REPORT

To comply with the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, the Secretary of Agriculture submits an annual report to Congress. This report summarizes the performance of the Forest Service in implementing the 1990 RPA Program, formally titled "The Forest Service Program for Forest and Rangeland Resources: A Long-Term Strategic Plan," in response to congressional direction and appropriations for FY 1991. The report presents output results as well as fiscal information and highlights of Forest Service activities during FY 1991 that helped to advance the four major strategic objectives of the RPA Program: 1) recreation, wildlife, and fisheries resource enhancement; 2) environmentally acceptable commodity production; 3) improved scientific knowledge about natural resources; and 4) responding to global resource issues. These high-priority themes serve as a strategic guide for the Forest Service and its activities during fiscal years 1991 through 1995.

### The Forest Service

The Forest Service mission focuses on four management areas:

- The National Forest System
- State and Private Forestry
- International Forestry
- Research

### The National Forest System

The National Forest System consists of units of federally-owned lands in the United States and its Territories, united into one integral system and dedicated to the long-term benefit of present and future generations. The system consists of all national forests; national grasslands; land utilization projects; and other lands, waters, or interests administered by the USDA Forest Service.

The National Forest System is managed pursuant to the Multiple-Use Sustained-Yield Act of 1960. The act directs that the National Forest System be managed using the principle of multiple use—the combination of uses of natural resources that best meets the demands and needs of the American people. The National Forest System provides a wide variety of recreation opportunities, maintains diversity of wildlife, supplies various wood-fiber products, ensures forage for wildlife and domestic livestock, sustains flows of quality waters, and offers many other products and services consistent with the principles of multiple use and sustained yield. Sustained yield requires that the output of products and services be continued in perpetuity, without impairing the productivity of the land.

In its commitment to conservation and its stewardship role for the National Forest System, the Forest Service attempts to find the appropriate balance between conflicting uses and public interests. Multiple-use sustained-yield principles have served as the Forest Service's "compass" for land management practices because this concept is useful in establishing direction and guiding courses of action, but does not set the eventual destination.

### State and Private Forestry

Through its State and Private Forestry programs, the Forest Service extends financial assistance and technical expertise in natural resource management and protection to non-Federal land areas throughout the United States and its Territories. The State and Private Forestry programs extend the Forest Service's expertise in natural resource management to more than 600 million acres of forests and grasslands beyond the boundaries of the National Forest System. The Forest Service works with State Foresters, American Indian Tribes and other State, local government, and private cooperators to implement these various programs.

### International Forestry

Through its International Forestry programs, the agency shares its diverse technical expertise and managerial skills in partnership with other nations that are concerned with global climate change and are committed to global resource conservation.

### Research

The Forest Service, through its various research programs and experiments, determines methods for achieving fuller and more effective use of forests and grasslands, and develops improvements in the production and utilization of forest products. The Forest Service conducts research in five broad areas of natural resource management: forest protection, resource analysis, forest management, forest environment and forest products, and harvesting.

## FORMAT OF THE REPORT

The chapter titled "The Resources Planning Act Program" includes information and a discussion of Forest Service activities in FY 1991 relating to the implementation of the 1990 RPA Program. The next three chapters report Forest Service performance on the National Forest System; on State, private or other Federal lands; and on activities in international forestry performed outside of the United States or its Territories. The status and significant findings of Forest Service research programs are reported in the fifth chapter. Information pertaining to Forest Service personnel and other administrative matters are provided in the sixth chapter.

Data for FY 1991 program accomplishments and outputs are displayed in tables at the end of this report.

A glossary of terms is also provided.

*Committee appointed in 1905 by Chief Forester Gifford Pinchot to revise the "USDA Use Book," the first Forest Service Manual for the operation of the Forest Reserves.*

Back row, left to right:
Forest Ranger B.H. Crow, Angeles National Forest, California; Forest Supervisor Daniel Marshall, Uinta National Forest, Utah; Forest Supervisor R.E. Miller, Teton National Forest, Wyoming; Forest Supervisor Edward A. Sherman, Bitterroot National Forest, Montana; Forest Ranger Leon F. Kneipp, Pecos National Forest, New Mexico; Forest Ranger Edward S. Mainwaring, Sierra National Forest, California.

Front row, left to right:
Forest Ranger Rufus King Wade, Gila National Forest, Arizona; Forest Supervisor Seth Bullock, Black Hills National Forest, South Dakota; Chief Forester Gifford Pinchot; Assistant Chief Forester Albert F. Potter.

# Chapter 1

# The Resources Planning Act Program

*From Promises to Performance*

Photo by Yuen-Gi Yee

## INTRODUCTION

The long-term strategic direction of the Forest Service is spelled out in the Secretary of Agriculture's Forest Service program for "Forest and Rangeland Resources: A Long-Term Strategic Plan" (RPA Program), which was published in 1990. That direction is consistent with the long-standing, basic direction of the organization, whose fundamental charge is to provide leadership for the Nation's forests. It is also responsive to new and emerging scientific information and public values. This chapter looks at the Forest Service, in FY 1991, through the lens of that strategic direction. It does not attempt to summarize or preview the succeeding chapters. Rather it reports on the agency's actions in pursuing its strategic direction.

The Strategic Plan of the Forest Service is an organizational reaffirmation of multiple-use management for our Nation's forests and grasslands. It is a multiple-use approach that improves balance among the resources, protects long-term ecosystem sustainability, and is attentive to the unique resource potential of different land units. Carrying out this strategy is a culturally and professionally diverse work force that is responsive to the American people, whom they serve. In this chapter, examples of accomplishments from Research, State and Private Forestry, the National Forest System, and International Forestry illustrate the types of actions being taken to achieve the agency's strategic intent. In some cases, the progress is excellent. In others, it is occurring at a slower rate than desired. Yet, on balance, the Forest Service is using its Strategic Plan as a pathway to the future.

*A ranger "at the office" during the early 1920's.* F.S. Photo

## THE STRATEGIC PLAN

The Strategic Plan of the Forest Service was, in part, based on an extensive scientific assessment of the resource situations associated with all forest and rangelands, published in 1989. The assessment results showed increasing demands for both amenity and commodity outputs from natural resources. As a result, the challenge is to meet these demands, while simultaneously managing the resource base to protect environmental quality. Selected output and projections from the 1990 RPA Program, as well as actual accomplishments, are shown in figure 3.

## FOUR MAJOR THEMES

Four major themes characterize the plan and the strategic direction of the Forest Service:

- Recreation, wildlife, and fisheries resource enhancement.
- Environmentally acceptable commodity production.
- Improved scientific knowledge about natural resources.
- Responding to global resource issues.

These themes are consistent with the multiple-use charge of the Strategic Plan and reflect recent developments in scientific information and public values. The themes represent the highest

*The Lost Creek Trail on the Mt. Hood National Forest provides a recreational opportunity to people of varying physical abilities.*
Photo by Tom Iraci

Figure 3.

**1991 RPA PROGRAM STATUS FOR THE USDA FOREST SERVICE**

| | ACTUAL | | PROJECTED | |
|---|---|---|---|---|
| | 1990 Resource Output | 1991 Resource Output | 1995 Resource Output | 2040 Resource Output |
| NATIONAL FOREST SYSTEM | | | | |
| Air-quality monitoring (number sites) | 247.0 | 287.0 | 362.0 | 636.0 |
| Minerals (operations) | 25,927.0 | 25,348.0 | 37,899.0 | 38,126.0 |
| Recreation use (million visitor/user days) 1/ | 263.1 | 278.8 | 308.0 | 531.4 |
| Trail construction (miles) | 1,637.0 | 1,921.3 | 2,396.0 | 1,471.0 |
| Wilderness (thousand acres) | 33,200.0 | 33,579.0 | 35,350.0 | 39,064.0 |
| Range grazing (million AUM) | 9.6 | 9.5 | 9.3 | 9.2 |
| Range condition (thousand acres in satisfactory condition) | 37,557.0 2/ | 37,557.0 | N/A 2/ | 52,606.0 |
| Timber offered (billion board feet) | 11.1 | 6.2 | 10.8 | 12.0 |
| Clearcut harvests (thousand acres) | 229.2 | 186.6 | 265.0 | 233.0 |
| Wildlife & fish (million user days) 3/ | 42.0 | 42.7 | 48.9 | 119.8 |
| T&E species objectives met | 16.0 | 36.0 | 75.0 | 202.0 |
| STATE & PRIVATE FORESTRY | | | | |
| Timber stand improvement (thousand acres) | 187.0 | 257.0 | 870.0 | 1,000.0 |
| Multiresource management plans (thousand acres) 4/ | 3,504.0 | 5,671.5 | 9,000.0 | 11,800.0 |
| Tree planting (thousand acres) | 887.0 | 1,100.0 | 3,300.0 | 800.0 |
| RESEARCH | | | | |
| Recreation, wildlife, water (% total cost) | 25.0 | 26.0 | 26.0 | 29.0 |
| Timber, forest products (% total cost) | 36.0 | 35.0 | 32.0 | 30.0 |
| Forest economics, inventory (% total cost) | 16.0 | 16.0 | 18.0 | 18.0 |
| Forest protection(% total cost) | 23.0 | 23.0 | 24.0 | 23.0 |

1/ Includes wildlife and fish (million user days).
2/ Not applicable.
3/ Includes acres funded by Forest Resource Management and Stewardship.
4/ Estimate based on 1989.

priority work of the agency. In this chapter, the themes are used as a framework around which actions taken to fulfill the organizational strategy are reported.

**Recreation, Wildlife, and Fisheries Resource Enhancement**

**Recreation.** The Nation's forests provide a wide array of recreational opportunities for the U.S. population. Recreational use of the national forests continues to increase, as shown in figure 4. Use is expected to continue to increase in the future, but the mix of recreation activities will change to reflect changes in the U.S. population. The Forest Service is committed to serving the changing recreational demands of a more diverse American public.

A number of additional special recreation use areas were designated in FY 1991 to be added to existing systems: 25 Scenic Byways, 362 miles of Wild and Scenic Rivers, 1 National Recreation Area, and 1 National Scenic Area. An additional 322,229 acres were added to the National Wilderness Preservation System.

**Wildlife and Fish.** Forests and grasslands provide habitat for a variety of fish, wildlife, and plant species. Forest Service programs aim to manage this habitat to conserve biological diversity, ensure viable populations of plants and animals, and enhance recreational use opportunities. The recreational use of the National Forest System for hunting, fishing, wildlife viewing, and photography continues to increase, as shown in figure 5.

Enhancement of wildlife and fish resources is being emphasized on private lands through stewardship programs. State Foresters provide leadership through technical and financial assistance to private landowners in these programs. The multiresource plans that are prepared as part of this effort give full consideration to wildlife, fish, and recreation resources.

*Clean water, natural surroundings, and friends are the ingredients for an enjoyable outing on Anthony Lake, Wallowa-Whitman National Forest in Oregon.* Photo by Richard T. Nowitz

The 1990 RPA Program outlines aggressive pursuit of recovery objectives for threatened and endangered species and comprehensive management of sensitive species in order to slow down and prevent the need for additional Federal listings. The Threatened, Endangered, and Sensitive (TES) Species program has funded management of the high-profile species, such as the northern spotted owl and grizzly bear. However, the program has also increasingly involved recovery or management of less visible plant, aquatic, and nongame species. In FY 1991, increased funding allowed the program to cover over 140 species. An additional positive indication is the progress being made toward RPA goals relating to the number of species' objectives met (figure 6).

Figure 4.

**Recreation Use, Including Wildlife and Fish**

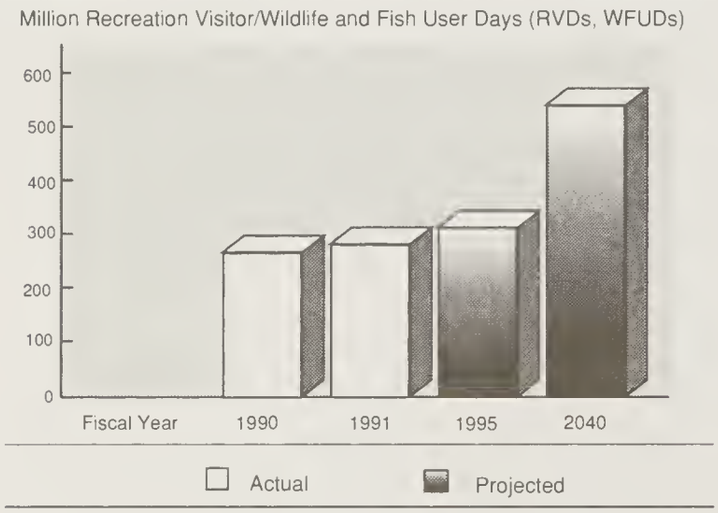
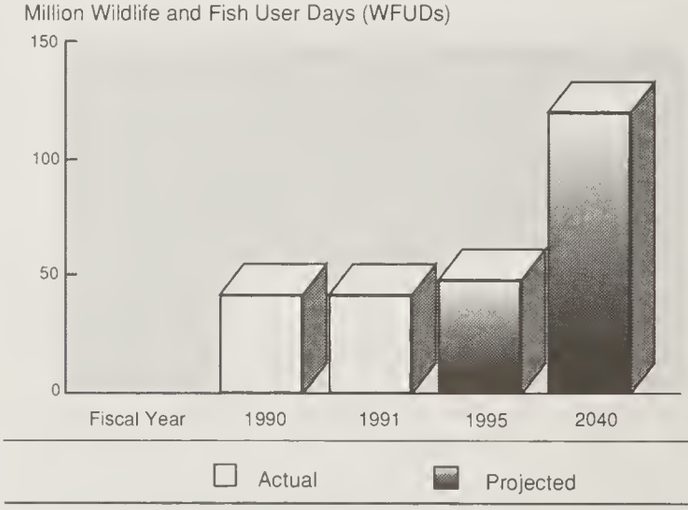



Figure 5.

**Recreation Use—Wildlife and Fish**

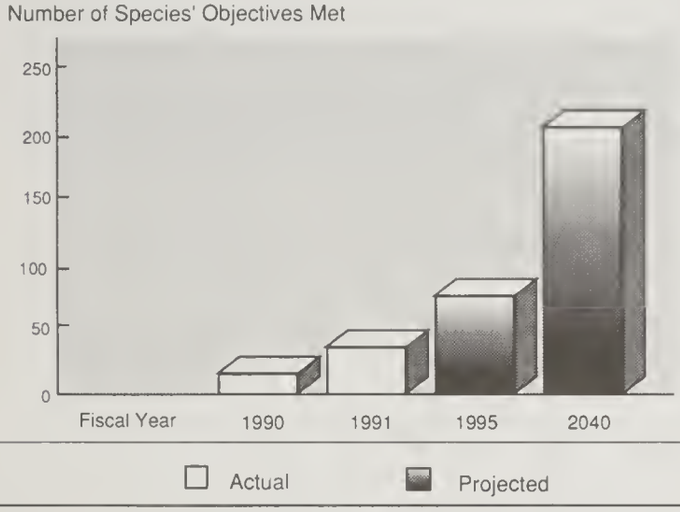



Funding for research on threatened, endangered, and sensitive species increased in FY 1991. Research was conducted at more than 20 locations on more than 70 species, but with emphasis on the northern spotted owl, red-cockaded woodpecker, grizzly bear, and Puerto Rican parrot. Efforts are increasing on threatened

southwestern fish and on species associated with old-growth forests, including pine marten, marbled murrelet, Vaux's swift, and Del Norte salamander.

In FY 1991, the "Rise to the Future" fisheries program published an updated action plan that provides direction for fisheries resource enhancement and for the management of commodity-oriented resources that are environmentally acceptable as outlined in the 1990 RPA Program. The Forest Service also published the "National Assessment of Fisheries Research Needs."

Figure 6.
**National Forest System Threatened and Endangered Species Accomplishments**




This assessment outlines pressing fisheries management information needs of the National Forest System and identifies the research required to fill the information gaps.

The 1990 RPA Program cites national concern about protecting riparian areas from loss and deterioration. In FY 1991, the Forest Service, in partnership with the Bureau of Land Management and the National Fish and Wildlife Foundation, initiated the "Bring Back the Natives" program to restore the health of riverine systems and their native species.

The 1990 RPA Program projected a four-fold increase in nonconsumptive use (e.g., wildlife viewing, picture-taking, fish release, etc.) of wildlife and fisheries resources by the year 2040. To meet this demand, the Forest Service has implemented the "Eyes on Wildlife" program to: 1) provide enhanced recreation opportunities, 2) promote learning about forest animals and plants, and 3) develop broad public support for the conservation of plant and animal species.

### Environmentally Acceptable Commodity Production

Production of commodity resources such as timber, forage, and minerals remains a key commitment of the Forest Service. Sound

*A research technician takes field measurements of red-cockaded woodpecker habitat on the Croatan National Forest in North Carolina.*
Photo by Ken Hammond

management, which puts a priority on meeting forest plan standards and guidelines for such considerations as soil and water protection, satisfactory rangeland conditions, and threatened and endangered species, is guiding the production of commodity resources in the Forest Service.

Two key indicators of the timber program are volume of timber offered and acres clearcut. Figure 7 displays a decline in timber offered on the National Forest System in FY 1991. The large decrease in offer level from FY 1990 reflects management actions taken in response to environmental concerns such as protection of the northern spotted owl, red-cockaded woodpecker, and old-growth forests, as well as delays resulting from administrative appeals and litigation. The number of acres being clearcut on national forests were fewer than projected in the Strategic Plan (figure 8). The plan calls for a steady decline in clearcut acres, from 320,000 in FY 1989, to 265,000 in FY 1995. The large reduction in clearcut acres in FY 1991 was due partially to congressional direction to reduce clearcut acres by 25 percent between fiscal years 1989 and 1995; however, much of the reduction was due to a decrease in volume offered. The plan projects an increasing reliance on partial cut regeneration techniques during future years.

Forest Service attention to forest pest management is consistent with the theme of environmentally acceptable commodity production. Forest pest suppression projects protected an estimated 705 million cubic feet of merchantable timber across all ownerships. Additionally, the Forest Service was proactive in its extensive assessments of the risk of introducing forest pests into North America through the importation of unprocessed logs from Siberia and the Russian Far East.

The Forest Resource Management Program provides technical assistance to State Foresters on protecting and enhancing soil and water resources. Current emphasis is being placed on a number of areas, including protection of soil productivity, monitoring nonpoint source pollution control, and forested wetland management.

The philosophy of conserving and sustaining healthy rangeland ecosystems guides livestock grazing on the National Forest System. Livestock grazing is permitted on approximately 9,800 allotments in 33 States. Improved management was implemented on 148 grazing allotments in FY 1991. Special emphasis was given to allotments with riparian management problems and allotments with declining rangeland conditions or overstocked ranges.

Existing NEPA documents for a number of national forests with high potential for oil and gas were revised during FY 1991 as part of an ongoing effort to ensure proper environmental protection. The Forest Service and the Bureau of Land Management entered into an interagency agreement that established coordination procedures for environmental consideration of both leasing and development proposals.

Forest Service Research is increasing emphasis in the area of developing environmentally safe methods of extending the life of wood in use. Examples include technologies that could maximize the conversion of wood to energy and minimize the emission of volatiles in emissions, and the development of biological and physiological processes for preserving wood.

The Rural Development Program was begun in FY 1991. As part of the Administration's overall strategy for rural America, this program allows the Forest Service to assist rural communities in their efforts to diversify their local economic bases through wise and environmentally sensitive use of natural resources.

### Improved Scientific Knowledge About Natural Resources

New scientific knowledge is essential for improving our ability to manage resources. Research results have provided new insights into the workings of biological systems, and also provided new techniques to produce outputs in a more environmentally sound manner. This new knowledge also allows policymakers to make more informed policy decisions about our natural resources.

Figure 7.
**Total Timber Offered**

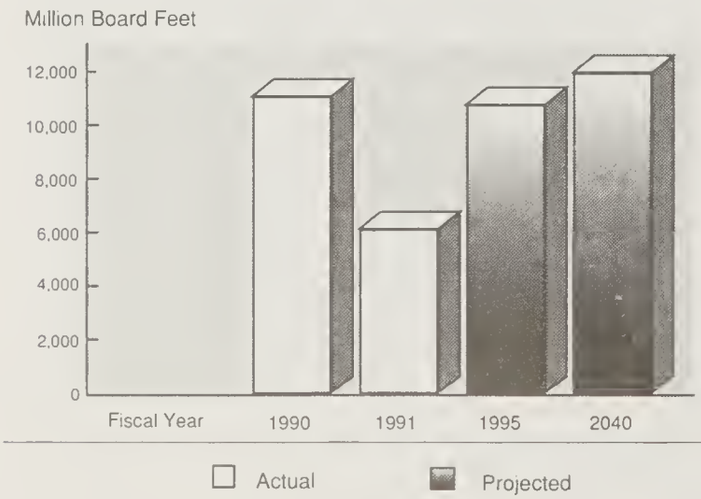
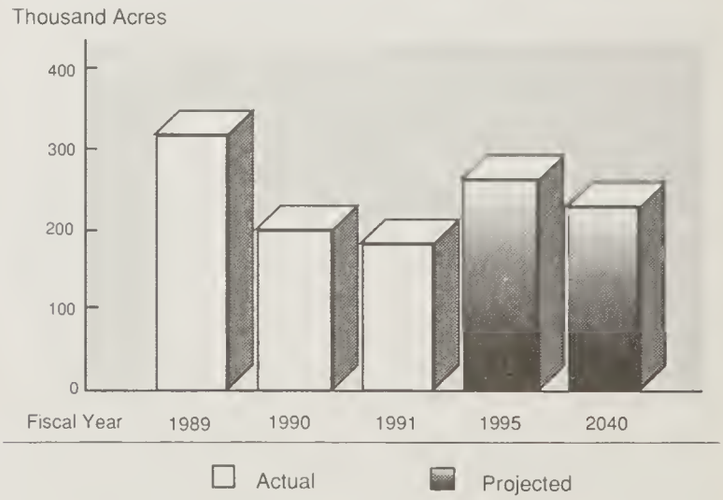



Figure 8.
**Clearcut Harvests**



*Restored stream in riparian area on the Fremont National Forest in Oregon.* Photo by Tom Iraci

The Forest Health Monitoring Program was expanded to 12 States in FY 1991. The addition of these 6 new States is the beginning of a program that will give an annual assessment of the national and regional health of America's forests, as well as detailed knowledge of those ecosystems, so that detected changes can be explained, understood, and managed.

The Natural Resource Conservation Education Program was launched in FY 1991. Managed in partnership with State Foresters, extension agents, and others, this program will disseminate scientific knowledge through structured education of targeted audiences.

Research on beneficial organisms has advanced the potential for their use in promoting forest health and biological control of pests. An important step was made in developing a more effective virus for biological control when a natural gypsy moth virus was genetically engineered with a "marker gene"—a tool to identify the altered virus. Research on pheromones for control of bark beetles has expanded the potential usefulness of these safe natural materials for reducing losses in high-value areas. The Wallenberg prize was awarded to a Forest Service scientist for contributions to the use of beneficial root-inhabiting fungi to improve growth and survival of trees planted on harsh sites.

In FY 1991, the Forest Service established 41 new Research Natural Areas (RNA's), the most established in any single year since the program's inception in 1927. With over 250 established, RNA's are becoming increasingly important for providing baseline information used in monitoring forest plans and the effects of management activities, and in contributing to the protection of biological diversity.

Recycling research has produced new advances in several areas. A new approach to wood pulping, biomechanical pulping, has the potential for creating energy savings, improving paper strength properties, and reducing environmental impact. Research has also demonstrated a method to blend wastepaper and waste plastic to develop composites with superior properties compared to existing composites. Commercial manufacture of such products could create additional markets for recyclable materials, thus providing an economic incentive for expanded recycling.

By providing better scientific knowledge, Forest Service Research contributed to policy discussions in several areas in FY 1991. A prominent example is the role of Forest Service researchers in the Interagency Scientific Committee report on the northern spotted owl. This research contributed to the only science-based management strategy for recovery of the northern spotted owl.

In FY 1991, the Pinchot Institute for Conservation Studies began providing a forum for the promotion and discussion of natural resource conservation. Much of the dialogue at the Institute centers around enriching public policy options for forest management with the latest in scientific discovery.

### Responding to Global Resource Issues

Recognizing the interdependence of the environmental and forest ecosystems the world over, this fourth theme is an explicit statement of the need to focus attention beyond the physical boundaries of the United States.

The Forest Service established a new Deputy Chief position for International Forestry in FY 1991. This Deputy Chief is challenged with focusing leadership and facilitating actions related to international and global issues for the agency.

The Forest Service's Forestry Support Program initiated a new agreement with the USDA Office of International Cooperation and Development, and the Peace Corps. This agreement provides for implementation of the U. S. Agency for International Development's Forest Resources Management Project, which promotes the contribution of trees to sustainable development worldwide, and strengthens the capacity of forest management institutions in the developing tropical countries.

Working with more than 100 organizations and in numerous countries, the Forest Service's Tropical Forestry Program made major contributions toward better environmental and forest resource management of the tropical resources. Most notable are the many demonstration efforts underway in the Latin American, Caribbean, and South Pacific regions.

The Forest Service continued to cooperate with many other countries in attempting to manage major wildfires and other natural disasters. It provided technical assistance on wildfires to a number of countries in FY 1991, including Israel, Spain, and Brazil. The Forest Service cooperated with foreign countries on managing insect and disease problems.

Figure 9.

**Total Reforestation on Nonindustrial Private Forest (NIPF) Lands and Projected Accomplishments with S&PF Assistance**

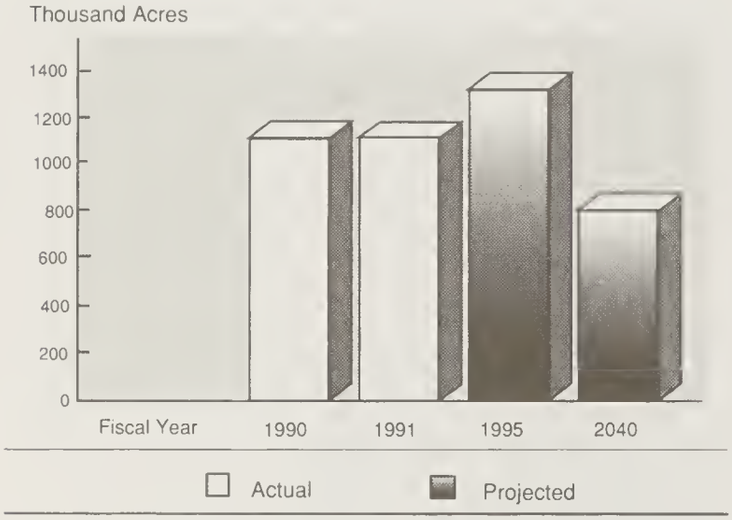
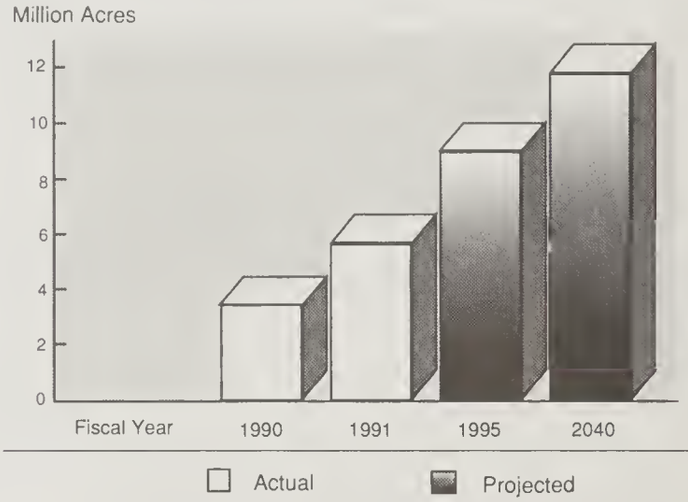



Figure 10.

**State and Private Forestry Multiresource Plans***




* Includes acres funded by forest resource management and stewardship.

Though domestically based, the tree planting and forest improvement efforts initiated pursuant to the America the Beautiful Act of 1990 are related directly to efforts aimed at global resource issues. The tree planting accomplishments of FY 1991 (figures 9 and 10) are seen as a way to conserve energy and positively affect the carbon dioxide balance, two of the world's pressing issues.

The Global Change Research Program was initiated to increase our understanding of the implications of climate change. To date, results have included a model of future forests in a "greenhouse" climate, as well as information on the effect of acid deposition on tree growth and possible energy savings from strategic tree planting.

## SUMMARY

The Strategic Plan for the Forest Service (1990 RPA Program), with its four themes, provides a good framework from which agency activities can be monitored. Those activities provide a purposeful course of action that is consistent both with Forest Service history and with evolving scientific information and public values. Program examples cited here and in the following chapters reveal the organization's chosen path. When coupled with the diversification of the Forest Service's work force, these indicators point to an organization committed to providing global leadership in the environmental and natural resource management community.

*Old-growth Douglas-fir forest provides important habitat for some wildlife species and has many other values.* Photo by Tom Iraci

*Forest patriarch, a 3,000-year-old bristlecone pine, in the Ancient Bristlecone Forest, on the Inyo National Forest in California.* F.S. Photo

## Chapter 2

# National Forest System

*Integrated Resource Management — Multiple Use in Action*

Photo by Jim Hughes

## INTRODUCTION

In FY 1991, the Forest Service, the forestry profession, conservationists, the forest products industry, and the Nation celebrated the 100th anniversary of the establishment of the National Forest System. More importantly, they celebrated 100 years of natural resource conservation, based on the principles of multiple use, sustained yield, and integrated resource management practices.

Until the late 19th century, Federal land policy was to dispose of public lands in an effort to promote settlement and raise revenue. On March 30, 1891, President Benjamin Harrison, under the authority granted in the Forest Reserve Act, reserved the Yellowstone Park Timber Land Reserve (now part of the Shoshone and the Teton National Forests) for the public. This was an important first step in the conservation of America's natural resources. Within the next decade, Presidents Grover Cleveland and Theodore Roosevelt designated most of the land now in the National Forest System.

There are now 156 national forests, 20 national grasslands, and 71 experimental forests in the 191-million-acre National Forest System. The System contains 80 percent of the country's habitat for elk, mountain goat, and bighorn sheep, more than half of the salmon and steelhead spawning and rearing habitat in the lower 48 States, and over 200 threatened and endangered species. It receives more recreation visitors than any other public land area, contains 47 percent of the softwood timber in the country, and holds important deposits of platinum, copper, silver, lead, and molybdenum.

## CENTENNIAL CELEBRATION

The primary goals of the National Forest System centennial observation were to bring together the American people and their national forests and to heighten the public's consciousness of natural resource conservation. Secondary goals were to encourage the integration of conservation history and issues into school curricula; to increase the knowledge of Forest Service personnel about the history, significance, and future of the National Forest System; and to increase the public's awareness and understanding of the multiple-use mandate under which the National Forest System is managed.

To commemorate the centennial, Congress declared June 1991 as National Forest Month. District, station, forest, and regional offices, as well as the Washington Office, decorated their offices for the year and invited the public to visit during National Forest Month. Local offices sponsored special events—reunions, parades, dedications, and special community presentations. Special postal cancellations and envelopes were designed for some national forests and for special events, such as the Centennial Rendezvous. Forests, such as the Nebraska National Forest, sponsored major events for the public in honor of their unique place in American conservation.

Celebration events included a national poster art contest, a national history conference, a rededication ceremony of the first Forest Reserve, and a national futures conference on land ethics, stewardship, and leadership.

*Early travelers enjoyed the natural resources and beauty of the national forests.* F.S. Photo

### A New Perspective

This celebration marked 100 years of conservation resource management. Now the agency's sights are directed toward the next 100 years. Over the next 5 to 10 years, the Forest Service will aggressively pursue actions to enhance the recreation, wildlife and fisheries resources; to increase environmental sensitivity during commodity production; to improve the Nation's scientific knowledge about natural resources; and to respond to global resource issues. The agency will continue its commitment to multiple use by increased use of integrated resource management prescriptions and practices.

## LAND MANAGEMENT PLANNING

The National Forest Management Act of 1976 (NFMA) required the Forest Service to develop forest plans for each administrative


*Chief F. Dale Robertson sealing a time capsule with memorabilia, books, and essays about management of the National Forest System. The time capsule was lowered into an earthen vault during centennial celebration ceremonies on the Shoshone National Forest, Wyoming, America's first Forest Reserve. Observing are Wapiti District Ranger Francis J. Carlson (left) and Assistant Secretary for Natural Resources James Mosley (right).* Photo by Jill Bauermeister

unit of the National Forest System. The forest plans are a single integrated plan for each unit, developed by an interdisciplinary team with public participation and review, to provide for multiple use and sustained yield of products and services from the National Forest System in accordance with the Multiple-Use Sustained-Yield Act of 1960.

The Forest Service, as required by NFMA, developed regulations to set out the process for developing and revising the forest plans, specifying procedures to ensure that forest plans are prepared in accordance with the National Environmental Policy Act of 1969.

### Revision of Forest Planning Regulations

The Forest Service is now engaged in a comprehensive review and evaluation of the National Forest System forest planning regulations. As a result of this review, an Advance Notice of Proposed Rulemaking was issued in the Federal Register, February 15, 1991. Public comment was invited in order to develop a proposed rule for implementation, amendment, and revision of forest plans; to establish the relationship between forest planning and project decisionmaking; and to make various other changes intended to simplify the planning process and respond to ideas identified during the regulatory review. Publication of the proposed rule in the Federal Register is expected in FY 1992.

### Status of Forest Plans

As of October 1, 1991, 115 forest plans were completed and are guiding management of those national forests. The Modoc, Stanislaus, Sierra, and Lassen National Forests in California have, or will have, issued final forest plans by February 1992, bringing the total of all final forest plans to 119. Only four will remain uncompleted, all of which are in California. The Klamath, Shasta-Trinity, Mendocino, and Six Rivers National Forests are revising their previously issued draft forest plans due to the

Department of the Interior's listing of the northern spotted owl as a threatened species. Revised draft forest plans will be published in 1992. The remaining California forests have finalized their forest plans.

In addition, 10 national forests throughout the Forest Service are in the process of revising their forest plans. Table 5 lists the draft and final forest plans and environmental impact statements prepared to date, as well as the plans currently being revised.

### Implementation and Monitoring of Forest Plans

The National Forest Management Act and planning regulations require monitoring and evaluation of completed forest plans. Monitoring and evaluation are used to: 1) determine whether the forest plan is being followed; 2) determine whether resource objectives are being met; and 3) evaluate whether the assumptions and models used in the development of forest plans are valid. Changes to the plans are made as needed. In FY 1991, over 150 amendments were made to forest plans on 60 national forests.

### Status of Forest Plan Administrative Reviews

The administrative review process allows persons outside the agency to challenge forest plan decisions and to request a review of the decisions by higher Forest Service organizational levels. The process ensures that reviews are conducted fairly. Since the first forest plans were finalized in 1979, more than 1,100 administrative reviews have been filed, with approximately 775 resolved. In FY 1991, 118 forest plan administrative reviews were resolved. These reviews required an average of 2 years to reach resolution. At the end of FY 1991, there remained a total of 320 forest plan reviews pending.

## NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

Forest Service activities and projects done to implement the respective forest plans receive environmental analysis and documentation in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations developed by the Council on Environmental Quality (CEQ). In FY 1991, the Forest Service continued its national effort to improve the quality of environmental analysis and compliance with NEPA in forest plan implementation. Training was provided to over 1,300 Forest Service employees, other Federal and State agency personnel, and interest group members. This national training focused on implementing forest plans, through effective project planning, in compliance with NEPA regulations and policy. The training involved 58 knowledgeable Forest Service instructors traveling around the country to 39 training sessions. This is the first such intensive, coordinated environmental analysis training conducted by the Forest Service.

The primary benefit of a consistent approach to implementing forest plans nationwide is better decisions. Public participation is invited throughout the plan implementation process. This includes pre-NEPA planning and project design, participating in the NEPA scoping and analysis, and the post-decision activities of monitoring and evaluating the implementation of projects and activities, all of which contribute to successful plan implementation.

*A ranger (circa 1930) reviews plans for managing the natural resources in a national forest.* F.S. Photo

## INTEGRATED RESOURCE MANAGEMENT—MULTIPLE USE IN ACTION

The National Forest System is managed for many activities in a variety of natural resource areas in accordance with the Multiple-Use Sustained-Yield Act of 1960 and the National Forest Management Act (NFMA) of 1976. The 1990 RPA Program demonstrates the Forest Service's commitment to a balanced, multiple-use management program within the context of increased environmental sensitivity.

Ecologically similar areas on the same forest can be managed differently as a result of multiple-use management. Differences in goals and objectives for these areas are based on integrated management needs identified and documented in forest plans. The uses of, and products from, the areas will vary according to these differences.

To illustrate multiple-use management, three National Forest System administrative units have been selected on which multiple-use management practices have been carried out in FY 1991: the Nebraska National Forest, the Nantahala and Pisgah National Forests, and the Willamette National Forest. Each national forest is described, then the selected ecologically similar areas are presented under "Selected Multiple-Use Management Areas." Following this section, resource management goals and management area direction are discussed for each selected area on the national forest or grassland. Resource management goals are based on the management area allocations and prescriptions in the forest plan. These goals, along with more specific standards and guidelines, are used to analyze and design projects to implement the forest plan and to manage toward a desired future condition for each area. Under management area direction, specific management activities to accomplish forest plan direction for each area are described.

Figures 11, 12, and 13 are used to illustrate the differences in product outputs and in uses for each of the selected areas.

### Nebraska National Forest

The Nebraska National Forest administers the Nebraska and Samuel R. McKelvie National Forests and the Oglala, Buffalo Gap, and Fort Pierre National Grasslands. These units cover approximately 1.1 million acres in central and northwestern Nebraska and central and southwestern South Dakota. Vegetation and topography vary from that typical of the Nebraska sandhills to that found in the Badlands of South Dakota. The Bessey Nursery and the Pine Ridge Job Corps Civilian Conservation Center are also administered as part of the Nebraska National Forest.

Livestock grazing has been the primary traditional use on these national forests and national grasslands. However, forest plan goals encourage identifying opportunities and management practices to enhance and develop wildlife habitat and recreational uses.

### Selected Multiple-Use Management Areas

The multiple-use management areas described below are the Oglala Area and the Conata Basin.

The Oglala Area includes the entire Oglala National Grassland, a relatively small one (94,334 acres), located in northwestern Nebraska. This is an area of short- and mixed-grass prairie interspersed with streams, wooded draws, and occasional badlands formations. There is also a 1,800-acre native ponderosa pine forest. Elevations range from 3,500 to 4,000 feet above sea level; average annual precipitation is 16 inches. The landownership pattern is complex, with a mixture of private and public lands.

This area provides opportunities for a wide array of uses. Summer cattle grazing is the primary agricultural pursuit on the Oglala Area. The area provides the only public land for pronghorn hunters in Nebraska and is also a popular area for deer and wild turkey hunters. Plans are nearing completion for a Paleoindian Research and Learning Center at the 10,000-year-old Hudson-Meng Bison Kill Site, which is among the largest in the world. Toadstool Park Geologic Area is located in badlands formations that date from 26 to 34 million years ago and contain rich Oligocene Epoch fossil deposits. Developed facilities at Toadstool include a reconstructed sod house, recreation trail, and picnic ground.

The Conata Basin Area (58,380 acres) is located on the Buffalo Gap National Grassland in South Dakota and is bordered by the

*Conata Basin, in the Buffalo Gap National Grassland, is being considered as a possible reintroduction site for the endangered black-footed ferret.* Photo by Wyoming Fish and Game Department

Badlands National Park and Pine Ridge Indian Reservation. Mixed-grass prairie and badlands formations dominate the landscape. Elevations range from 2,300 to 3,000 feet above sea level; average annual precipitation is 15-1/2 inches. With a rugged backdrop of badlands outcrops and ridges, Conata Basin offers spectacular scenery and uninterrupted horizon-to-horizon openness.

Landownership patterns are complex in Conata Basin, with a mixture of private and public lands. An active land exchange program is underway to provide better public access and to enhance management of the prairie dog ecosystem.

Conata Basin is designated in the forest plan as a special interest area, emphasizing management of habitat for black-tailed prairie dogs and associated wildlife. A Coordinated Resource Management (CRM) committee is evaluating Conata Basin and the adjacent Badlands National Park as a reintroduction site for the endangered black-footed ferret. Livestock grazing in the Basin is limited to a level which promotes tall and dense grass growth, restricting the expansion of prairie dog colonies. This is part of an integrated pest management program designed to reduce the need for rodenticides to control prairie dog colony expansion and unwanted movement of prairie dogs to adjoining private lands. There are no developed recreation sites in the area; however, dispersed recreation is popular and includes hunting, sightseeing, wildlife viewing, rock hounding, and camping.

*National forest archeologist excavates 10,000-year-old bison bones at the Hudson-Meng Bison Kill Site on the Oglala National Grassland in Nebraska.* Photo by Jerry Schumacher

**Resource Management Goals**

The following resource management goals apply to both the Oglala and the Conata Basin areas:

- Manage vegetation for a full range of multiple-use outputs and conditions.
- Demonstrate sound land use practices for livestock grazing, wildlife habitat management, recreation development, etc.
- Design livestock grazing management systems that are coordinated with other resource uses, agencies, and landownerships.
- Protect and improve habitat for threatened and endangered species.
- Identify and protect significant historical and archeological sites.
- Develop an active land adjustment program.
- Provide an integrated pest management program to prevent and control unacceptable damage.
- Manage riparian areas, wooded draws, and shrub patches to sustain or enhance their biological, physical, and aesthetic values.

In addition, the Conata Basin area has the following goal:

- Emphasize habitat requirements of black-tailed prairie dogs and other associated wildlife.

**Management Area Direction**

**Oglala Area.** To achieve multiple-use management for this area:

- Provide 150 to 250 acres of active prairie dog colonies by no later than 1996.
- Ensure that grazing agreements established with grazing associations provide for integrated management of associated private and other public rangeland and consider interrelationships of other resources.
- Provide range improvements and conservation practices that are multipurpose in nature.
- Implement livestock grazing strategies that promote vegetation conditions less favorable for prairie dog colony expansion and establishment.
- Expand interpretive services to local and visiting publics.
- Improve public access to prairie dog colonies and develop quality interpretive services about prairie dog colonies.

Figure 11

**NEBRASKA NATIONAL FOREST**
**Oglala and Conata Basin Areas**
**Comparison of Physical Characteristics, Planned Outputs and Uses**

| | Oglala Area | Conata Basin Area |
|---|---|---|
| PHYSICAL CHARACTERISTICS | | |
| Size of area (acres) | 94,334 | 58,380 |
| Elevation (feet) | 3,500-4,000 | 2,300-3,000 |
| Forested land (acres) | 1,800 | 0 |
| Grassland-shrubland-wetland-badland (acres) | 92,534 | 58,380 |
| OUTPUTS AND USES | | |
| Recreation (recreation visitor days) | | |
| Dispersed | 2,400 | 23,000 |
| Developed | 3,100 | 0 |
| Transportation | | |
| Restricted motor vehicle areas (acres) | 2,640 | 0 |
| Road density (miles/640 acres) | 1 | 1 |
| Suitable for timber activities (acres) | 0 | 0 |
| Timber harvest (MMBF) | 0 | 0 |
| Suitable for livestock grazing (acres) | 92,794 | 52,040 |
| Livestock grazing | | |
| Estimated grazing capacity (animal unit months) | 26,905 | 13,720 |
| Actual FY 1991 grazing (animal unit months) | 26,184 | 7,460 |
| Wildlife-fish-threatened and endangered species | | |
| Inventory and monitoring (acres) | 51,400 | 58,380 |
| Number of structural improvements | 2 | 0 |
| Non-structural improvements (acres) | 10 | 0 |
| Active prairie dog colony (acres) | 280 | 4,320 |
| Threatened, endangered and candidate species | | |
| Bald eagle | Yes | Yes |
| Black-footed ferret (reintroduction) | No | Possible |
| Swift fox | Yes | Likely |
| Ferruginous hawk | Yes | Yes |
| Long-billed curlew | Yes | Yes |
| Barr's milkvetch | Possible | Yes |
| Dakota buckwheat | Possible | Yes |
| MANAGEMENT PRESCRIPTIONS (acres) | | |
| Livestock grazing emphasis | 72,029 | 0 |
| Wildlife habitat emphasis | 21,946 | 0 |
| Special interest area (archeological site) | 25 | 0 |
| Special interest area (prairie dog ecosystem) | 0 | 58,356 |
| Riparian ecosystem emphasis | 334 | 24 |
| Land exchange | | |
| Acres leaving federal ownership | 555 | 5,440 |
| Acres entering federal ownership | 600 | 5,020 |
| Federal-private boundary eliminated (miles) | 8 | 84 |
| Number of right-of-way needs eliminated | 1 | 6 |
| Number of private in-holdings eliminated | 1 | 17 |

**Conata Basin Area.** Direction to achieve multiple-use management in this area includes:

- Provide 5,200 to 5,850 acres of active prairie dog colonies by no later than 1996.
- Provide range improvements and conservation practices that are multipurpose in nature.
- Implement livestock grazing strategies that promote vegetation conditions less favorable for prairie dog colony expansion and establishment.
- Expand interpretive services to local and visiting publics.
- Improve public access to prairie dog colonies and develop quality interpretive services about prairie dog colonies.

### Nantahala and Pisgah National Forests

The Nantahala and Pisgah National Forests include 1 million acres of mountains and ridges in the southern Appalachian range of western North Carolina. Elevations range from under 1,000 to well over 6,000 feet above sea level on the highest mountains. The forests feature deep gorges and scenic waterfalls. The spectacular display of mountain laurel and rhododendron in the spring and colorful foliage in the fall attract thousands of tourists.

*Hiking and viewing wildlife are popular recreational activities on the National Forest System.* Photo by Richard T. Nowitz

### Selected Multiple-Use Management Areas

The Craggy Mountain Area (approximately 15,000 acres) is divided into two zones—the North and the South areas. The Blue Ridge Parkway traverses the ridgetop of the Craggy Mountain Area; several lookouts provide opportunities for some of the most spectacular views in the East. Craggy Mountain is a unique ecosystem. High-elevation spruce-fir forests, which are usually found in northern climates, occupy a portion of the Craggy Area. The spruce-fir forests also provide habitat for the endangered northern flying-squirrel. The area is also used by black bear due to the food source (acorns) provided by oak in a relatively undisturbed environment.

The Craggy Mountain Area was the selected land area for a pilot project to study and evaluate biodiversity. Through the planning process, the national forests combined forces with the Southeastern Forest Experiment Station. The objective of the project was to develop baseline data and establish useable methods for measuring and evaluating biodiversity on the national forests in the southern Appalachians. The two zones of the Craggy Mountain Area were chosen because they are ecologically similar forest areas; however, each zone is managed differently in order to achieve a unique set of goals and objectives.

The Craggy Mountain, North area, has approximately 10,000 acres. As with most areas in the East, large areas of the forests were cut over near the turn of the century, prior to its purchase by the Federal Government. In some places, the best trees were cut with little thought to regenerating a future forest. The forest that was left was composed of poor-quality trees. Roads were built into the area, some of which were constructed by the Civilian Conservation Corps during the 1930's. These roads are still used today for a variety of uses. A vigorous regional forest products industry prizes valuable hardwoods, such as northern red oak. Recreation visitors use the area, as do scientists at local universities who study the ecology of the area.

The Craggy Mountain, South area, has approximately 5,000 acres. Although it lies adjacent to the North area, the South area is uniquely different primarily in its landform which is mostly steep, rugged terrain, with rock outcrops and cliffs. There is no access to the area by motorized vehicles. Most of the area appears to have been left relatively untouched by humans through the centuries. Because of its rugged terrain and lack of access, few visitors enjoy the area at this time, even though it is one of the few areas left in a relatively primitive condition in the East.

### Resource Management Goals

#### Craggy Mountain—North Area

- Provide for the restoration and rehabilitation of the southern Appalachian ecosystem. Sites which are highly productive but left in poor condition prior to purchase by the Federal Government may be rehabilitated to restore the high-quality forests that once existed.

Figure 1.

**NANTAHALA AND PISGAH NATIONAL FORESTS**
**Craggy Mountain North and Craggy Mountain South Areas**
**Comparison of Physical Characteristics, Planned Outputs and Uses**

| | Craggy Mountain | |
|---|---|---|
| | North Area | South Area |
| PHYSICAL CHARACTERISTICS | | |
| Size of area (acres) | 10,932 | 4,273 |
| Elevation (feet) | 3,500 | 4,800 |
| Vegetation types | Oak/hickory | Oak/hickory |
| OUTPUTS AND USES | | |
| Timber harvest | | |
| Site rehabilitation (acres) | 400 | 0 |
| Regeneration for long-term supply (acres) | 400 | 0 |
| Volume (MBF) | 4,000 | 0 |
| Harvest methods | | |
| Even-aged (%) | 20 | 0 |
| Multiple-aged (%) | 80 | 0 |
| Recreational opportunities | | |
| Natural environment with roads open (acres) | 5,331 | 0 |
| Natural environment with roads closed (acres) | 5,601 | 253 |
| Backcountry, near-primitive areas | 0 | 4,020 |
| Trail construction (miles) | 0 | 5 |
| Wildlife habitats | | |
| Cove forests | 5,271 | 1,091 |
| Oak/hickory | 1,515 | 805 |
| Northern hardwood forests | 3,316 | 1,574 |
| Spruce fir forests | 215 | 584 |
| White pine | 33 | 0 |
| Non-forested | 582 | 255 |
| Older forest conditions (%) | 15 | 70 |
| Visual resource management | | |
| Highly visible (acres) | 3,200 | 4,273 |
| MANAGEMENT PRESCRIPTIONS (acres) | | |
| Riparian areas | 753 | 275 |
| Research natural areas | 53 | 0 |
| Scenic areas | 776 | 275 |
| Timber producing areas | 3,749 | 253 |
| Mature forest habitats | 5,601 | 853 |
| Wilderness study areas | 0 | 2,617 |
| INDEX OF BIOLOGICAL DIVERSITY (Shannon Index) | | |
| Trees | 3.466 | 2.961 |
| Reptiles and amphibians | 1.678 | 1.578 |
| Birds | 3.521 | 3.032 |
| Herbaceous vegetation | 5.251 | 4.842 |

- Manage for high-value hardwood sawtimber, which requires long rotation periods not usually provided on private lands. Provide high-value sawtimber to help meet both present local demand and a long-term supply in the future.

- Diversify silvicultural approaches and reduce the use of clearcutting.

- Maintain diversity of plant and animal communities. Provide a mixture of habitat that can be used by wildlife that need young forests, as well as by those animals that require mature forests.

### Craggy Mountain—South Area

- Manage the area for backcountry recreation; provide a near-primitive setting for forest visitors to enjoy.

- Maintain diversity of plant and animal communities. Protect special habitats, such as the spruce-fir forests that provide habitat for the northern flying-squirrel. Maintain the large component of older cove forests that provide habitat for black bear.

- Protect the beauty of the forests.

### Management Area Direction

Specific management practices will be chosen to accomplish forest plan direction for each area.

**Craggy Mountain—North Area.** Direction for this multiple-use area includes:

- Nearly 840 acres of the area qualify for rehabilitation. These are highly productive sites with existing poor-quality trees. Approximately 200 to 400 acres could be scheduled for rehabilitation in the next 5 years.

- Almost 60 percent of the forest is mature. There are few stands of trees in early age classes of 10 to 30 years. Harvesting mature forests on 200-400 acres in the next 5 years would provide for present local demand as well as long-term supply in the future.

- Utilize multiple-aged management harvest methods to maintain forest beauty.

- Monitor the area with surveys for measuring biodiversity to help determine the effects of management practices.

**Craggy Mountain—South Area.** Direction for this multiple-use area includes:

- Construct approximately 5 miles of trails in a loop system to enable forest visitors to access the area.

- Allow only natural disturbances to affect the plant and animal communities in the area, thus maintaining its near-primitive condition.

- Develop measures and monitor biodiversity in response to natural disturbances.

*In 1913, a North Carolina mountain family depended on the Pisgah National Forest to produce galax, useful in making wreaths and other floral decorations.* F S Photo

*Phantom Bridge, part of the Special Interest Area within the Detroit Ranger District, Willamette National Forest, Oregon.*
Photo by Samuel T Frear

*Scenic stream in Gordon Meadows, Willamette National Forest, Oregon.* Photo by J. Pratt

### Willamette National Forest

The Willamette National Forest includes 1.7 million acres and extends for 110 miles along the western slope of the Cascade Mountain Range of Oregon. The western edge of the forest borders the Willamette Valley, while the crest of the Cascade Mountains defines the eastern boundary. Eugene, Springfield, Albany, and Salem are major urban areas in the Willamette Valley, within an hour's drive to the forest. Several smaller towns and cities are located near or within the forest's boundaries.

The forest has a relatively mild climate, with precipitation occurring throughout most of the year, but with relatively dry summers. The higher elevations receive snow during the winter months. Except for the highest elevations near the crest of the Cascades, the forest is covered with various aged stands of Douglas-fir, western hemlock, Pacific silver fir, noble fir, and cedar.

### Selected Multiple-Use Areas

Elkhorn Creek and Gordon Meadows are areas on the forest that are similar not only in size, but also in overall physical and biological characteristics. Both are representative of the types of lands and resources found throughout the forest. Both selected areas are currently in roadless area status. During the development of the forest plan, different mixes of land allocations and management prescriptions were considered for each area, reflecting the resource capabilities, unique features, and public concerns for each area.

**Elkhorn Creek Area**. Situated in the northwestern part of the forest on the Detroit Ranger District, the Elkhorn area is characterized by a continuous forested canopy with rock outcrops. Hillsides are highly dissected and steep, with a diversity of age and size classes of timber resulting from a history of repeated fires. An outstanding attraction is the Phantom Natural Bridge. Cultural and social opportunities include a travel route to berry fields and hunting grounds used by Native Americans, remnants of historical mining activity, and a developed campground, as well as the privacy and solitude available through dispersed recreation. This area also provides a variety of possible resource outputs ranging from timber harvesting to a proposal for a bornite mining project.

**Gordon Meadows Area**. Gordon Meadows lies some 30 miles south of the Elkhorn area on the Sweet Home Ranger District. It is characterized by upland benches, flats, and ponds on the south side and highly dissected slopes to the north. Parts of the area represent a truly outstanding example of old-growth forest, including stands of timber in excess of 700 years old. Contrasted against these tall firs are unique, wet meadows hosting a variety of plants and wildlife, including one sensitive plant species. Activities such as fishing, hunting, hiking, and dispersed camping attract forest visitors; cultural resources have been recorded on 15 sites. While only limited timber harvest is planned in certain visually sensitive areas, the area hosts one of the few grazing allotments on the forest.

*A forester marking a Douglas-fir for precommercial thinning, Willamette National Forest, Oregon.* Photo by Louise Parker

### Resource Management Goals

#### Elkhorn Creek

- Preserve the exceptional geologic formation of Phantom Natural Bridge and foster public use and enjoyment of the area.
- Provide habitat for management indicator species associated with old-growth and mature conifer forests.
- Produce an optimum and sustainable yield of timber compatible with multiple-use objectives for soil, water, air, and wildlife.
- Provide facilities and improvements for developed recreation.
- Manage with moderate emphasis for big game.

#### Gordon Meadows

- Preserve natural conditions for ecological education and research.
- Preserve gene pools of plants and animals.
- Preserve representative ecosystems of old-growth forests.
- Provide opportunities for public education and enjoyment of old-growth forests.
- Protect or enhance unique wildlife habitats and botanical sites.
- Provide for nonmotorized recreation opportunities in a natural setting.
- Manage resource activities, such as timber harvest, with sensitivity to visual landscapes to provide a modest level of scenic quality.
- Manage with high emphasis for big game.

### Management Area Direction

**Elkhorn Creek.** Direction for this multiple-use management area includes:

- Harvest and regenerate 680 acres of suitable timber stands over the next 10 years in a manner that maintains a moderate to high level of visual quality.
- Process an operating plan for an underground bornite mining operation.
- Maintain and improve developed campsites in Shady Cove Campground.
- Prepare an implementation guide for the Phantom Bridge Special Interest Area defining site-specific objectives, enhancements, uses, and activities.

**Gordon Meadows.** Direction for this multiple-use management area includes:

- Conduct inventories of animals and vegetation in the Research Natural Area to collect baseline data. As necessary, conduct periodic remeasurements to maintain the inventories.
- Construct a loop trail in the Old-Growth Grove.
- Relocate 5 miles of trail and maintain the existing trail system.
- Harvest and regenerate 440 acres of suitable timber stands over the next 10 years in a manner that maintains a modest level of visual quality.
- Maintain 50 percent of the big game winter range in optimal cover condition.

Figure 3

**WILLAMETTE NATIONAL FOREST**
**Elkhorn Creek and Gordon Meadows Areas**
**Comparison of Physical Characteristics, Planned Outputs and Uses**

| | Elkhorn Creek Area | Gordon Meadows Area |
|---|---|---|
| PHYSICAL CHARACTERISTICS | | |
| Size of area (acres) | 8,958 | 8,361 |
| Elevation (feet) | 1,800-4,775 | 1,600-5,300 |
| Vegetation type | Douglas fir-hemlock; western red cedar. Forested canopy and rock outcrops. | Douglas fir-hemlock; Pacific silver fir. Dense forest, changing to meadow. |
| OUTPUTS AND USES | | |
| Recreation | | |
| Semiprimitive nonmotorized | | |
| Acres | 0 | 2,517 |
| RVDs | 0 | 1,572 |
| Semiprimitive motorized | | |
| Acres | 0 | 0 |
| RVDs | 0 | 0 |
| Roaded natural | | |
| Acres | 2,453 | 1,280 |
| RVDs | 9,337 | 12,447 |
| Roaded modified | | |
| Acres | 6,506 | 4,117 |
| RVDs | 4,100 | 5,790 |
| Developed recreation site (RVDs) | 3,090 | 0 |
| Trails (miles) | 7 | 14 |
| Grazing (animal unit months) | 0 | 140 |
| Planned road construction (miles) | 4.3 | 4.0 |
| Timber harvest | | |
| Acres | 683 | 438 |
| MBF | 6,344 | 3,763 |
| High elk emphasis management (acres) | 0 | 8,361 |
| Moderate Elk emphasis management (acres) | 8,958 | 0 |
| MANAGEMENT PRESCRIPTIONS (acres--with no timber harvesting) | | |
| Research natural areas | 0 | 725 |
| Special interest areas | 128 | 0 |
| Old growth groves | 0 | 683 |
| Wildlife habitat | 1,365 | 405 |
| Dispersed recreation, nonmotor | 0 | 1,792 |
| Developed recreation | 21 | 0 |
| Riparian | 299 | 85 |
| MANAGEMENT PRESCRIPTIONS (acres--with timber harvesting) | | |
| Special visual management | 2,623 | 4,671 |
| General forest | 4,522 | 0 |


*Forest rangers in 1911 with an early boundary marker on the San Isabel National Forest in Colorado.* F.S. Photo

## NATIONAL FOREST SYSTEM LANDS

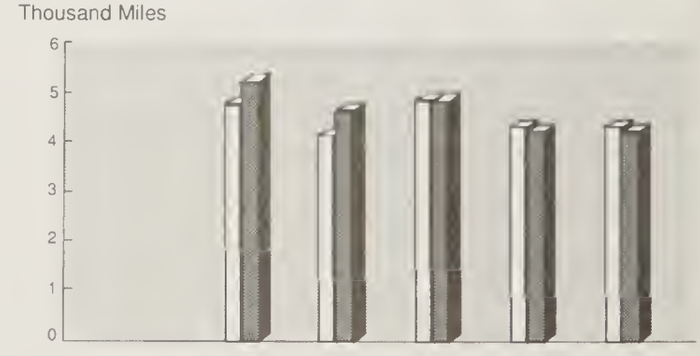
Providing an identifiable, accessible, and manageable public land base is an essential first step in fulfilling the Forest Service's stewardship responsibilities for the 191-million-acre National Forest System (table 6). The lands program activities adjust landownership patterns, identify necessary legal boundaries, provide access for public use, respond to public and private sector applications to use these Federal lands, and protect public and private interests through accurate land status and title information.

### Landline Location

The accurate location of landlines—the legal boundaries between National Forest System lands and other ownerships—is essential for managing public lands, protecting them from encroachment, and providing resources for public use. Adjacent non-Federal lands and specially designated areas are protected from trespass. In FY 1991, the Forest Service located 4,232 miles of property boundary lines, at a cost of $29.9 million (figure 14). At the end of FY 1991, 103,224 miles, or 38 percent of the 272,409 miles of National Forest System property boundaries, were properly established (table 7).

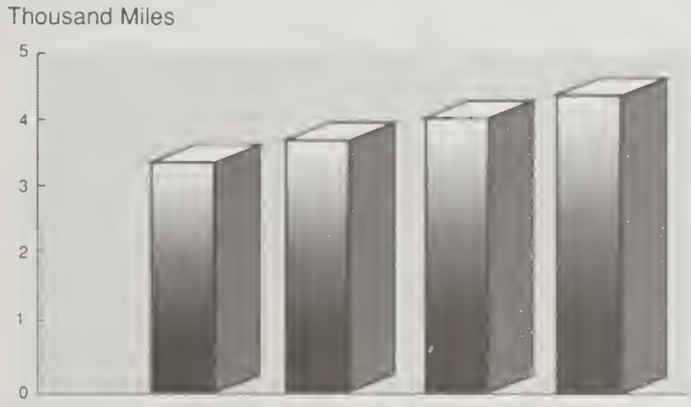
Landline maintenance is becoming a greater concern as the miles of boundaries that have deteriorated increase, due to either severe weather conditions or development activities. Experience has shown that boundaries generally need maintenance every 10 years. Figure 15 shows the magnitude of the situation.

Figure 14.
**Landline Location Accomplishments**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Funded | 4.7 | 4.1 | 4.8 | 4.3 | 4.3 |
| Accomplished | 5.2 | 4.6 | 4.8 | 4.2 | 4.2 |

Figure 15
**Landline Maintenance Backlog**



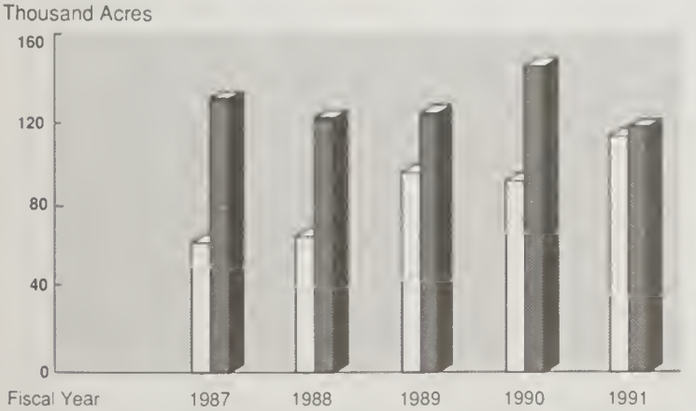

| Fiscal Year | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|
| Backlog | 33.4 | 36.8 | 39.8 | 43.4 |

The rapidly rising number of congressionally designated and other specially designated areas is increasing the need for legal land surveys to locate the boundaries. As of FY 1991, the inventory of these boundary lines was over 31,000 miles. Of these lines, 17,785 miles have already been identified for survey needs, but only 1,220 miles of the boundaries have been located and marked.

### Land Exchanges

The Forest Service exchanged 78,970 acres of National Forest System land for 121,997 acres of non-Federal land in FY 1991 (figure 16, table 8). Much of the non-Federal land acquired through land exchanges lies within classified wilderness areas, national recreation areas, wild and scenic rivers, national trails, and other congressionally designated areas. The acquired lands include thousands of acres of critical wildlife habitat, wetlands, and riparian areas. Through these exchanges, National Forest System property boundary lines were reduced by 755 miles, saving approximately $4.5 million in future landline location costs—about 62 percent of the $7.3 million costs of the exchanges. Additional savings will also be realized from fewer trespass and right-of-way cases and special use permits.

Figure 16.
**Land Exchange Accomplishments**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Funded | 65 | 68 | 99 | 95 | 117 |
| Accomplished | 135 | 126 | 128 | 151 | 122 |

### Small Tracts Act Parcels

In FY 1991, a total of 102 cases were resolved under the 1983 Small Tracts Act, involving sale or exchange of 360 acres of National Forest System lands. In return, the United States received 238 acres of land and $1,552,649. These cases included unmanageable parcels of various sizes and shapes located between mineral patents, small parcels innocently occupied, and road rights-of-way no longer needed. Since February 1984, following implementation of the Small Tracts Act, 1,314 cases, most involving encroachment, have been resolved.


*State-of-the-art land surveying technologies are employed on the San Bernardino National Forest, California.* Photo by Roy Murphy


*When completed, approximately 850 miles of the over 2,000-mile Appalachian Trail will be located on the National Forest System.*
Photo by Roy Murphy

### Land Acquisition

The Land and Water Conservation Fund Act land acquisition program was advanced significantly during FY 1991 through the addition of 67,321 acres to the National Forest System. Many of these acquisitions reduced long-term management costs by improving landownership patterns affecting cultural resources. These lands included critical habitat for threatened and endangered species, essential habitat for game and nongame wildlife, and hundreds of miles of fishable streams, rivers, and lake shore. The program added thousands of acres to congressionally designated areas such as wilderness, wild and scenic rivers, national scenic trails, and national recreation areas.

### Rights-of-Way

The Forest Service acquired more than 378 miles of road rights-of-way in FY 1991, through 551 cases, which will improve or protect access to the National Forest System for all users (figures 17 and 18). However, nearly 10 percent of National Forest System lands still lack adequate legal access.

### Special Land Uses

The administration of 51,000 nonrecreation and recreational special uses returned approximately $5 million in rental fees during FY 1991. Special uses include communication sites, roads and highways, power transmission lines, and various types of pipelines. Special-use permit administration ensures protection of natural resources while supporting activities that meet the needs of the American public.

Figure 17.
**Miles of Right-of-Way Acquired**

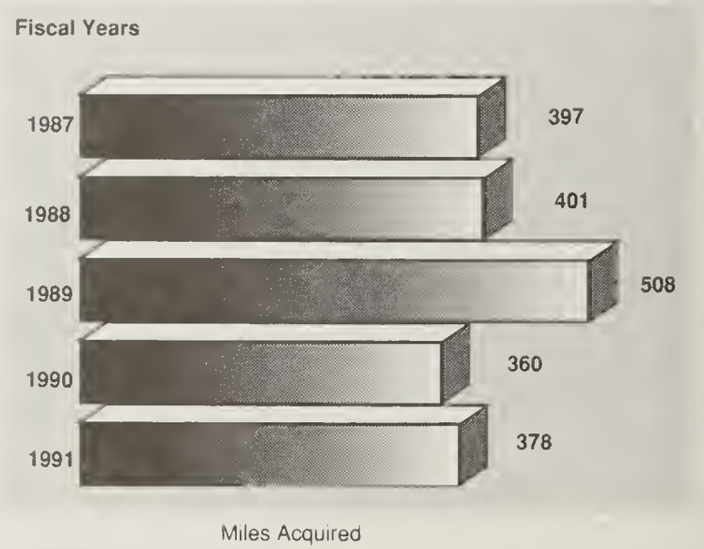
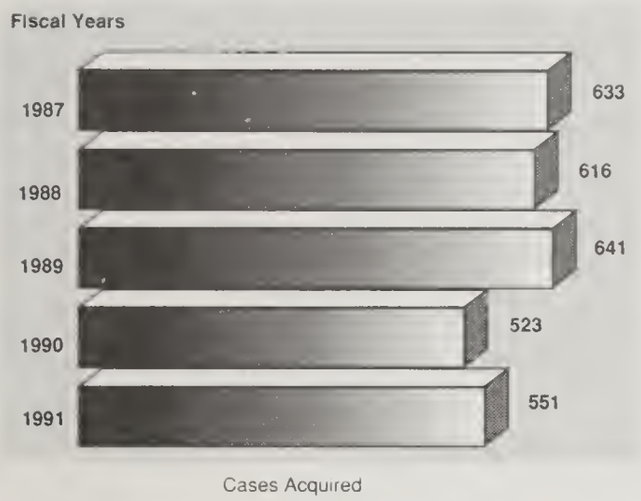


Figure 18.
**Right-of-Way Acquisitions**




## WILDLIFE, FISH, AND RARE PLANTS MANAGEMENT

The National Forest System provides diverse habitats for more than 3,000 species of birds, mammals, reptiles, fish, and amphibians, as well as for more than 2,000 rare plant species. The Forest Service manages habitat to produce wildlife and fish; protect threatened, endangered, and sensitive species; and provide recreational opportunities such as hunting, fishing, and wildlife viewing for all national forest users.

In FY 1991, the National Forest System provided 15.9 million user days of recreational fishing, with an economic value of more than $1.05 billion of recreational fishing (figures 19 and 20). Nearly 169 million pounds of fish from the National Forest System were commercially harvested in FY 1991, at a value of more than $175.8 million. The National Forest System provided 16.1 million user days of sport hunting, at an economic value of $644 million (figures 19 and 20).

Photography, bird watching, and nature study are becoming increasingly popular. In FY 1991, the National Forest System provided 10.7 million user days of nonconsumptive use. This use is valued at approximately $449 million (figures 19 and 20). The number of combined visits to fish, hunt, and view wildlife on the National Forest System is expected to increase by 183 percent in the next 50 years.

*The land beyond this gate is part of the Gallatin National Forest, Montana, and is representative of the 10 percent of the National Forest System that is not accessible to the public.* Photo by Mike Williams

Figure 19.
**FY 1991 Hunting and Fishing User Days**


Note: Wildlife and fish user days are also included in recreation visitor day total.

Figure 20.
**FY 1991 Wildlife and Fisheries Funding and Benefits**


Benefits

### Partnerships for Wildlife, Fish, and Rare Plants

In managing habitat on the National Forest System, the Forest Service cooperates with State fish and wildlife agencies that are responsible for managing animal populations and with other Federal agencies and conservation groups. Examples of programs are "Join Us," an effort to strengthen public-private partnerships in wildlife habitat and fisheries management; "Rise to the Future," a national program that emphasizes improving fisheries habitat and recreational fishing opportunities; "Get Wild," a national program that includes wildlife habitat enhancement programs, such as "Taking Wing" and "Making Tracks;" and "Every Species Counts," a national program to conserve and manage threatened, endangered, and sensitive species on national forests.

In FY 1991, the Forest Service and its partners turned $11.0 million of Federal funding into $28 million worth of habitat improvement projects on the National Forest System. Challenge cost-share program accomplishments included 5,956 habitat structures such as nest boxes, fish ladders, and watering devices; 41,946 acres of improved habitat; and 1,549,429 acres of habitat inventory for effective management of wildlife, fish, and threatened, endangered, and sensitive species.

Five-year growth trends in the number of partnerships—from 196 in FY 1987 to 2,380 in FY 1991—and in the number of contributions have been phenomenal (figures 21 and 22). More than $3 of challenge cost-share money was contributed by partners for every $2 of appropriated funds.

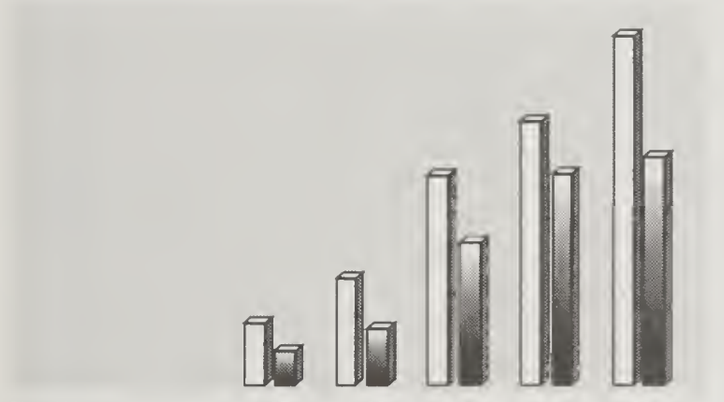
*With tender care, this young fawn is placed (circa 1940) in a nursery pen at the Pisgah Fawn Nursery in the heart of a 100,000-acre game refuge in North Carolina.* Photo by Clint Davis

### "Get Wild!"—The Forest Service's Wildlife Program

The overall strategy for "Get Wild" is to protect and improve habitat for wildlife species. Special emphasis is given to turkey, grouse and woodcock, elk, quail, bighorn sheep, deer, cavity nesting species, as well as to wildlife appreciation and viewing. In FY 1991, a primary program focus was waterfowl habitat restoration and improvement through implementation of the North American Waterfowl Management Plan on the National Forest System.

Within the framework of "Get Wild," the Forest Service cooperates with State and other Federal agencies as well as wildlife interest groups to maintain biological diversity on the National Forest System. They inventory, survey and enhance habitat, monitor wildlife habitat and populations, provide interpretive and educational opportunities for forest users, and protect special habitats

Figure 21.
**Wildlife Challenge Cost-Share Funding**



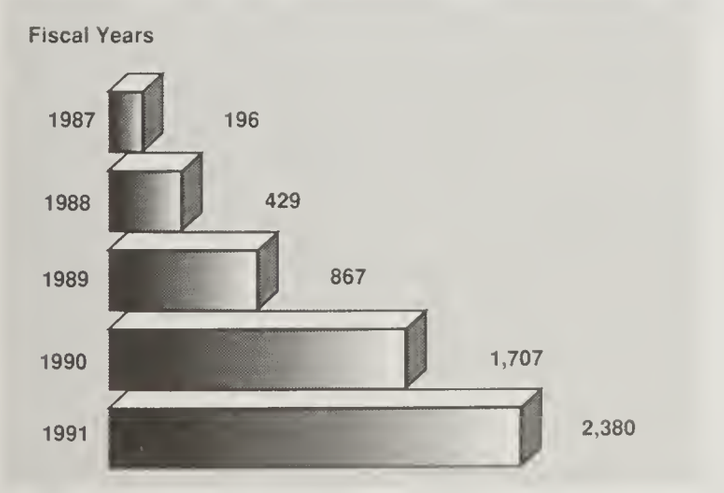
| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Million 1991 Dollars) | | | | |
| Cooperators | 3.1 | 5.2 | 10.2 | 12.8 | 16.9 |
| Forest Service | 1.7 | 2.9 | 6.9 | 10.3 | 11.1 |

such as snags and riparian areas. In FY 1991, the Forest Service made wildlife habitat improvements on 329,607 acres, including 168,164 acres funded with Knutson-Vandenberg (K-V) funds and 2,877 with excess timber receipt funds. The Forest Service also constructed 52,334 wildlife structures, including 43,961 structures funded with Knutson-Vandenberg funds and 49 funded with excess timber receipt funds (table 9). Challenge cost-share program funds improved 37,251 acres of habitat and contributed 2,749 structures. The following are examples of "Get Wild" program accomplishments in FY 1991:

- **Wildlife Viewing Area Enhancement**. A self-guided birding tour was developed on the Pawnee National Grasslands in northeastern Colorado. Thousands of birding enthusiasts visit annually to observe the more than 220 bird species that pass through or nest on the grasslands. Cooperators developed a brochure explaining each of 13 stops along the tour, and developed and installed accompanying interpretive signs. Joining the Forest Service in this "Eyes on Wildlife" project were numerous volunteers: the Greeley Chapter of the Audubon Society, Colorado Audubon Council, and the Colorado Division of Wildlife.

*Partners in conservation.* Photo by Mary Lynn Cagle

Figure 22.
**Wildlife Challenge Cost-Share Cooperators**




- **Managing Human-Black Bear Interaction.** The Coronado National Forest in Arizona formed a partnership with the North American Bear Society to develop posters, in English and Spanish, advising forest users on safe behavior and on proper food storage in black bear habitat. The Society constructed attractive signs that were installed by a local Boy Scout troop. The Society also built and installed 30 bear-proof food boxes for campers to use in developed campgrounds. Funding for purchases of materials was made possible by Safari Club International.

- **Elk, Deer, and Ruffed Grouse Management**. In Montana, the Red Lodge Ranger District on the Custer National Forest teamed up with the Ruffed Grouse Society and the Montana Department of Wildlife, Fish, and Parks to improve aspen stands for ruffed grouse, elk, and deer through prescribed burning and selective cutting.

*The National Forest System provides habitat for more than three million deer.* Photo courtesy of Soc Clay, Inc.

**"Rise to the Future! "— The Forest Service's Fisheries Program**

The National Forest System supports 2.2 million acres of lakes and reservoirs, 128,000 miles of fishable rivers and streams, and 16,500 miles of coast and shoreline. These waters produce valuable habitats for hundreds of inland and anadromous fish species, including more than 50 percent of the spawning and rearing habitat in the lower 48 States for salmon and steelhead. National Forest System waters provide habitat for 41 threatened and endangered fish species and 92 sensitive fish species.

The Forest Service initiated the "Rise to the Future" program in FY 1987 to encourage partnerships to help recover threatened and endangered fishes, to improve the quality of fish habitats, to expand fishing opportunities for all anglers, and to provide opportunities for viewing fish in their natural habitats.

**Inland Fish**. In FY 1991, the Forest Service received $17.7 million—a $4.8 million increase over FY 1990—in appropriated funds for inland fish habitat management on the National Forest System. The Forest Service improved 13,838 acres of inland fish habitat, including 1,268 acres funded by Knutson-Vandenberg funds and 1,014 acres funded by excess timber receipt funds. The Forest Service also constructed 9,985 inland fish habitat structures, including 2,299 funded by Knutson-Vandenberg funds and 323 funded by excess timber receipt funds (table 9). Through the challenge cost-share program, partners contributed to 3,937 acres of habitat improvements and completion of 2,770 structures. Two examples of inland fisheries improvement projects completed in FY 1991 are:

- **Lake Powhatan Recreational Fisheries Project**. With strong support from the North Carolina Council of Trout Unlimited and the North Carolina Wildlife Resources Commission, the Pisgah National Forest built a 140-foot, fully accessible fishing pier on Lake Powhatan. During National Fishing Week, the pier and adjacent shoreline were the focal point for an event involving more than 550 children.

- **Sparks Lake Coldwater Fisheries Habitat Improvement Project**. The Deschutes National Forest, in a cooperative project with the Oregon Department of Fish and Wildlife, Central Oregon Flyfishers, and Trout Unlimited, provided fry and juvenile rearing habitat for wild trout by placing 34 tree bundles, comprised of three to five 10-foot trees with branches intact, in strategic areas around the lake and 11 structures along the shoreline.

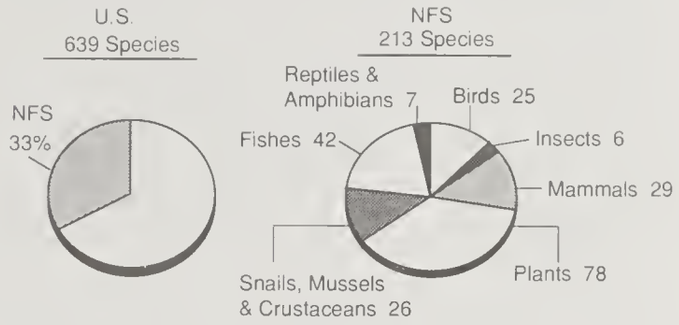
**Anadromous Fisheries.** Funding for anadromous fish habitat management increased from $18.2 million in FY 1990 to $23.6 million in FY 1991, reflecting an increase in public awareness of anadromous fish habitat conservation. Appropriated funds and Knutson-Vandenberg funds supported improvement of 7,019 acres and construction of 3,624 structures for salmon and steelhead (table 9). Through the challenge cost-share program, partners contributed to 61 acres of habitat improvements and completion of 265 structures. Habitat restoration and enhancement projects for

anadromous fish included removal of barriers restricting fish movement, restoration of stream habitat degraded by past human activities, and restoration of spawning and rearing habitats, as well as the following partnership projects:

- **Atlantic Salmon Restoration**. The Green Mountain National Forest in Vermont, in partnership with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and Vermont Department of Fish and Wildlife, continued efforts to restore Atlantic salmon to 120 miles of forest streams in the Connecticut River Basin. In FY 1991, six stream habitats were restored, more than 200,000 salmon fry were seeded into three streams on the Manchester and Rochester Ranger Districts, and streamside habitat was purchased along 5 miles of the White River.

- **Wenatchee River Salmon Festival**. The Wenatchee National Forest in Washington, in cooperation with the U.S. Fish and Wildlife Service, the Leavenworth Chamber of Commerce, and a variety of other cooperators, hosted the first annual Wenatchee River Salmon Festival. More than 8,000 people, including 2,500 children, attended the 4-day celebration featuring environmental education activities.

Figure 23.
**Species Federally Listed as Endangered or Threatened**




The National Forest System provides habitat for 33 percent of all federally listed species in the United States. These species include all varieties of life—from mammals, to plants, to mussels.

### "Every Species Counts!"—The Forest Service's Threatened, Endangered, and Sensitive Species Program

The National Forest System is home to 213 plant and animal species listed as either threatened or endangered by the U.S. Fish and Wildlife Service (figure 23). This is equivalent to 33 percent of all federally listed species nationwide. Successful recovery of these species depends on Forest Service collaboration with Federal and State agencies, private organizations, and individuals. In addition, the Forest Service has identified 2,280 sensitive species that are managed to prevent the need for Federal listing.

In FY 1991, the Forest Service reviewed its policy concerning protection of threatened and endangered species and management of sensitive species. As a result, the Forest Service Manual chapter on rare species was rewritten to clearly distinguish between management of federally listed species and Forest Service designated sensitive species. The revised policy will streamline project-level procedures to prevent sensitive species from becoming federally listed as threatened or endangered.

*Botanists conduct an inventory of Cuyamaca meadowfoam, a rare plant found on the Cleveland National Forest in California.* F.S. Photo

*Monitoring fish populations on the Ouachita National Forest in Arkansas.* Photo by Faith Skoog

Coordination and implementation of conservation activities are part of the Threatened, Endangered, and Sensitive (TES) Species Program operations, which were funded at $26.5 million in FY 1991. The Forest Service coordinated with the U.S. Fish and Wildlife Service on 90 recovery plans in FY 1991, including plans for the American peregrine falcon, grizzly bear, and northern spotted owl. Through its "Every Species Counts" initiative, the Forest Service is broadening the emphasis of the TES species program to manage for and conserve plant communities and aquatic species.

In FY 1991, the Forest Service improved 94,128 acres of habitat for threatened, endangered, and sensitive species, including 27,584 acres funded by Knutson-Vandenberg funds and 8,000 acres funded by excess timber receipt funds. The Forest Service also constructed 2,373 structures to benefit threatened, endangered, and sensitive species, including 177 structures funded by Knutson-Vandenberg funds and 27 structures funded by excess timber receipt funds (table 9). Through the challenge cost-share program, partners contributed to 696 acres of habitat improvements and completion of 172 structures.

Accomplishments in FY 1991 for TES plants included recovery activities for the federally threatened western prairie-fringed orchid in North Dakota and, in California, implementing the ecosystem management plan for the biologically diverse Pebble Plain habitat, which is home to eight sensitive species. In Oregon, the Forest Service teamed up with other Federal and State agencies to conduct surveys and studies on the federally endangered MacFarlane's four-o'clock, a rare plant found on the Hell's Canyon National Recreation Area. Most regions now have updated sensitive plant species lists, and the number of full-time botanists employed by the Forest Service increased more than 25 percent in FY 1991.

In FY 1991, forests and regions continued to work closely with State natural heritage inventory programs to conduct surveys and develop conservation strategies for sensitive species, the majority of which are plants. These strategies provide needed management actions to maintain population viability, thereby preventing the need for species to become federally listed. The Forest Service completed 60 conservation strategies or species management guides in FY 1991.

Western regions involved with grizzly bear management continue to implement the long-range grizzly bear recovery plan. In FY 1991, more than $2 million from several sources were invested in mapping the threatened bear's habitat, reducing human-grizzly bear conflicts, improving habitat, managing access into grizzly bear habitat, and providing public education. In addition, an agreement was signed between the Russian Academy of Sciences and the Interagency Grizzly Bear Committee, of which the Forest Service is a member, to exchange information and initiate joint activities aimed at reducing human-brown bear conflicts. Through this unique partnership, grizzly bear managers are evaluating the potential use of Russian bear dogs to reduce conflicts in and adjacent to grizzly bear recovery areas.

*All in a day's catch!* Photo by Tom Iraci

*Newly hatched red cockaded woodpecker.* Photo by Ken Hammond

### Neotropical Migrant Bird Program

"Partners in Flight" was initiated in FY 1991. A cooperative effort among the Forest Service and numerous State, Federal, and international agencies and conservation groups, it focuses on neotropical migrant bird species that nest in North America and winter in the Caribbean, and Central and South America. Many of these species are declining, in part due to habitat fragmentation on the breeding grounds and loss of wintering habitat. Program activities focused on population management, habitat monitoring, habitat improvement, training for resource professionals, and public education activities.

### Wildlife and Fisheries Habitat Relationship Program

Housed at Utah State University in Logan, the Forest Service's Wildlife and Fisheries Habitat Relationships (WFHR) Program provides information, methodology, and technology to the agency's field units to help ensure that wildlife and fish needs are adequately addressed in forest plans and forest management activities. In FY 1991, the WFHR assisted the field by developing new techniques for inventorying wildlife, fish, and rare plants on the National Forest System, as well as assisted with database development and Geographic Information Systems application to help Forest Service personnel inventory and monitor habitat conditions. The WFHR disseminated inventory techniques and computer databases to more than 100 biologists in the Forest Service, Bureau of Land Management, State agencies, and foreign countries.

The WFHR continues to play a prominent role in developing continuing education shortcourses for Forest Service employees whose work involves management of wildlife, fish, and rare plant species. The continuing education program provides both entry-level and mid-career professionals with state-of-the-art information and technical skills required of resource managers. In FY 1991, courses included Basin Surveys and Applications, Program Management for Biologists, Application of Geographic Information Systems for Fish and Wildlife Problems, and Managing Forest Structure and Composition. In FY 1991, 370 biologists from the Forest Service, Bureau of Land Management, and State agencies completed courses sponsored by the WFHR.

### Timber, Range, and Minerals Support

Congress appropriated $106.6 million for wildlife, fisheries, and rare plant management on the National Forest System in FY 1991. Of these appropriated funds, $10.9 million were allocated to timber support to fund resource coordination activities by wildlife and fisheries biologists, as well as botanists, involved in the planning and review of approximately 16,300 timber sales. In FY 1991, biologists also assisted in the development and review of 7,995 range allotment management plans and approximately 3,500 minerals cases.

*Wildlife and rare plant viewing is a popular recreation pursuit for visitors to the National Forest System.* Photo by Jim Hughes

## RECREATION, CULTURAL RESOURCES, AND WILDERNESS MANAGEMENT

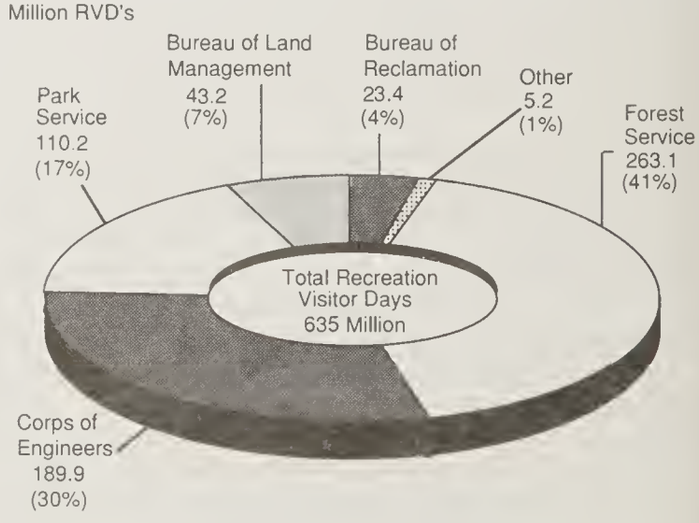
### Recreation

The National Forest System offers a wide spectrum of recreation—from wilderness to urban experiences, from organized activities to individual hunting and fishing trips, from guided auto tours to white water rafting, and from bird watching to volunteering on archaeological projects.

In FY 1991, visitors spent 279 million recreation visitor days (a recreation visitor day is 12 visit hours, by one or more persons) on the National Forest System, a 6-percent increase over FY 1990 (table 10). This represents 597.6 million visits to the National Forest System in FY 1991. Figures 24 and 25 show total Forest Service recreation compared to other Federal agencies and recreation use by activity. Table 11 displays the distribution of recreation use by activity for each State. Total recreation visitor days listed include wildlife user days and fish user days. The 1990 RPA Program projects a 102-percent increase (base year 1990) toward 2040.

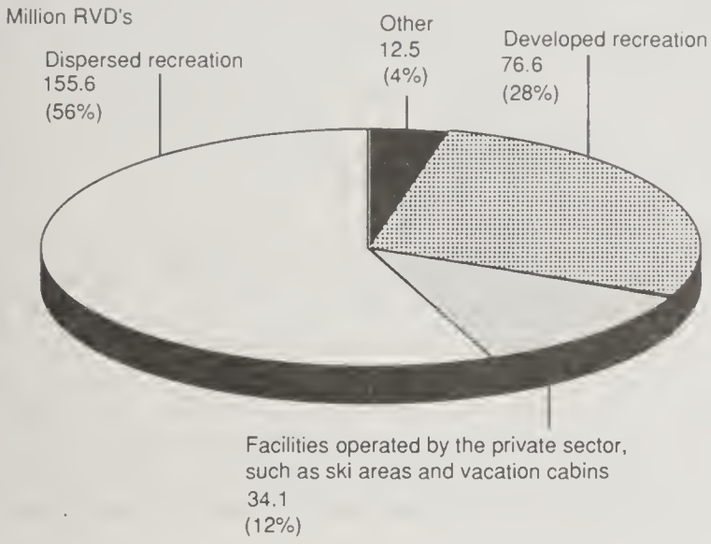
Total recreation receipts in FY 1991 were $43 million, a 5-percent increase over FY 1990. Appropriations for recreation were $198.8 million (figure 26). Fees recovered 22 percent of total recreation costs. Fees for the use of National Forest System campgrounds and other facilities generated $15 million in FY 1991, compared with $14 million in fiscal years 1990 and 1989. Fees for winter sports areas generated $14.2 million; recreation residences contributed $8 million; outfitters and guides paid $2.6 million; resort revenues were $2.2 million; and other recreation use fees were $1 million. The total recreation special-uses fees totaled $28 million in FY 1991, compared with $27.5 million in FY 1990.

Figure 24.
**FY 1990 Recreation Visitor Days by Federal Agency***



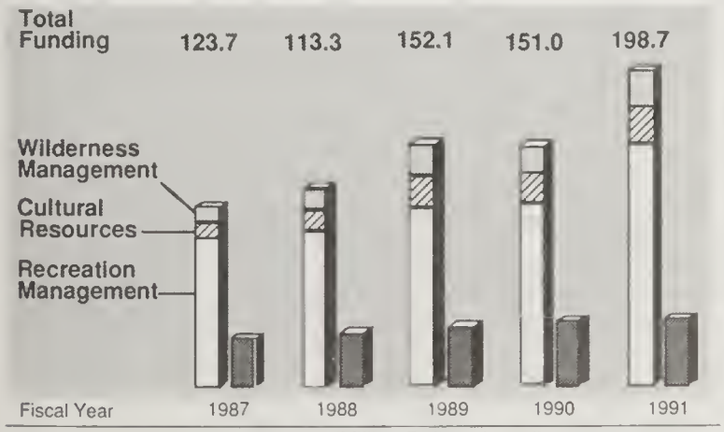

* FY 1991 agency data not yet available.

Figure 25.
**FY 1991 Recreation Visitor Days by Activity**




The number of interpretive associations increased from 48 in FY 1990 to 52 in FY 1991. Interpretive associations are nonprofit, public service organizations established to further the understanding of resource management on the National Forest System. Services include visitor center staffing, map and book production and sales, and the purchase of equipment for interpretive programs. In FY 1991, gross receipts from interpretive associations increased 35 percent compared to FY 1990, from $4.7 million to $6.3 million. Associated benefits to the Forest Service increased 25 percent, from $2.2 million to $2.7 million.

Figure 26.
**Recreation—Funding and Receipts**




(Million Dollars Actual)

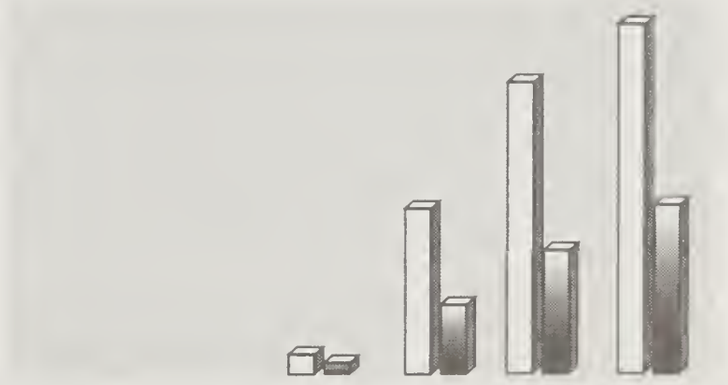
| Funding: | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Wilderness | 10.3 | 12.6 | 19.8 | 17.4 | 22.6 |
| Cultural Resources | 9.7 | 14.2 | 20.9 | 18.1 | 23.5 |
| Recreation Management | 93.3 | 96.9 | 111.6 | 115.5 | 152.6 |
| Receipts | 30.6 | 34.3 | 38.0 | 41.2 | 42.9 |
| Receipts as Percentage of Funding | 27 | 28 | 25 | 27 | 22 |

### Challenge Cost-Share and Volunteers

In FY 1991, partners in the challenge cost-share program contributed time and labor valued at $23.3 million on 1,377 projects. In recreation challenge cost-share projects, the Forest Service and its partners cooperatively accomplish work such as constructing campgrounds, trails, and interpretive sites, and investigating archaeological sites (figure 27).

Volunteers and participants in the Touch America Project contributed work valued at $22.8 on recreation-related projects. This represents 67 percent of the total work contributed in Forest Service volunteer programs. Figure 28 displays the cost-share and other volunteer programs' contributions.

Figure 27.
**Recreation Challenge Cost-Share Funding**




(Million 1991 Dollars)

| | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|
| Cooperator Share | 1.0 | 7.6 | 13.3 | 15.9 |
| Forest Service Share | 0.6 | 3.2 | 5.7 | 7.8 |

### Trends

The nature of recreation has changed in the last decade. The public now wants educational opportunities, interpretation of natural and cultural resources, and special areas to learn about the environment. Most importantly, visitors today want to be involved in caring for the land. The visitors themselves are also changing and now include more senior citizens, and people of diverse ethnic backgrounds.

The President's recreation initiative, America's Great Outdoors (AGO), concentrates on interpretation/education services, facilities improvement, and establishment of special areas. All of these allow the Forest Service to respond to trends and enhance recreation resources in accordance with strategy in the 1990 RPA Program.

Figure 28.

**VALUE OF WORK CONTRIBUTED**

| | Project Number | Amount of FS Funding | Amount of Partner Contribution |
|---|---|---|---|
| | | | *1,000 dollars* |
| Challenge Cost-Share - Recreation | 1,168 | 8,065 | 21,828 |
| Challenge Cost-Share - Cultural Resources | 140 | 894 | 1,506 |
| Challenge Cost-Share - Wilderness | 112 | 546 | 1,110 |
| Volunteer & Touch America Project | N/A 1/ | N/A | 22,752 |
| | | | 47,196 |

1/ Not available.

During FY 1991, the Forest Service began to improve access to recreation programs, facilities, and services for all visitors including those with physical, sensory, and cognitive disabilities. The agency initiated new interpretive programs to improve access to and understanding of cultural resources, developed new partnerships for expanded environmental interpretive programs, and joined in interagency partnerships to encourage both domestic and international tourism on Federal lands.

In order to serve all visitors without segregating the elderly and those with disabilities, the Forest Service has embarked on an interagency effort to develop state-of-the-art access standards for outdoor recreation facilities, programs, and services. Through America's Great Outdoors, the agency is evaluating recreation facilities to identify and remove barriers to accessibility.

During FY 1991, the Forest Service initiated the "Passport In Time" program, offering opportunities across the country for volunteers to work with professional archaeologists and historians on projects, such as archaeological excavation and historic reconstruction. "Passport In Time" broadens the scope of environmental education and meets a growing demand for recreation that actively involves visitors in caring for the resources. Also during FY 1991, the agency signed three new agreements with Amtrak's National Rail Passenger System, offering a full range of visitor services for passengers as they travel through or adjacent to the National Forest System. The available services include staffing certain Amtrak routes with professional interpreters.

The Forest Service has joined with the U.S. Fish and Wildlife Service, Bureau of Land Management, and National Park Service

*Early-day skiers enjoy winter play in the national forests.* F.S. Photo

*Physically-challenged ski instructors training at Crested Butte Mountain Resort in Colorado.* Photo by Tom Stillo

to provide programs for domestic and international tourism and has established a partnership with the U.S. Travel and Tourism Administration (Dept. of Commerce) to encourage foreign travelers to visit the National Forest System. A pilot project is underway in Utah, integrating natural and cultural resource opportunities using the concepts of eco-tours and heritage tours on public lands.

### Trails

Cross-country skiers, hikers, horseback riders, all-terrain vehicle riders, motorcyclists, snowmobilers, bicyclists, and recreationists with disabilities use the Forest Service's trail system. The total trail system now has 116,585 miles, compared to 95,348 in FY 1975 (table 12). In FY 1991, the Forest Service constructed or reconstructed 1,921.3 miles of trails. An additional 255 miles were constructed through contributed funds in challenge cost-share projects and by volunteers. Most work involved the reconstruction of existing trails.

*Retired citizens volunteer their talents to build a boardwalk on the Apalachicola National Forest in Florida.* F S. Photo

The "Leave No Trace" program is a user ethics program initiated by the Forest Service primarily for wilderness backpackers. In FY 1991, the Forest Service joined with two Department of the Interior agencies—the Bureau of Land Management and the National Park Service—to broaden the scope of "Leave No Trace" to address outdoor ethics needed by all nonmotorized recreationists. Through this effort, the agencies are developing partnerships with the private and nonprofit sectors to increase awareness of outdoor ethics among urban populations, to develop and propagate the "Leave No Trace" ethic among Forest Service employees and public lands visitors, and to conduct research on effective low-impact practices. The Forest Service and the National Outdoor Leadership School signed two memoranda of understanding: to develop a course in low-impact practices and instruction, and to distribute "Leave No Trace" materials.

### Scenic Byways Program

Driving for pleasure and viewing scenery accounts for more than 34 percent of total recreation use on the National Forest System. The National Scenic Byways program identifies travel routes that traverse scenic corridors with outstanding aesthetic, cultural, or historical values. These byways offer motorists a spectrum of unique forest settings ranging from dense rain forests to northern hardwoods to mountain tundra and alpine forests.

The Forest Service designated its first National Forest System scenic byway in FY 1988. In FY 1991, we added 25 new byways. Today, the agency manages nearly 100 national scenic byways, covering 4,900 miles in 31 States.

### Recreation Facility Management

Developed recreation sites in the National Forest System experienced 77 million recreation visitor days of use in FY 1991, compared with 74 million in FY 1990. Over 18,000 facilities, including campgrounds, trailheads, boat ramps, picnic areas, and visitor information centers, as well as privately owned facilities on the National Forest System such as recreation residences and ski resorts, can accommodate 1.8 million people at one time (PAOT). This is a 5-percent increase over the FY 1990 capacity of 1.7 million PAOT's. (Note: The figure reported in the FY 1990 Report of the Forest Service did not include privately-owned facilities on the National Forest System.)

### Wild and Scenic Rivers

The National Wild and Scenic Rivers System now totals 9,496 miles; 3,417 miles are managed by the Forest Service. Of the 125 rivers or river segments in the system nationwide, the Forest Service manages 70.

In FY 1991, the 101st Congress added to the system the Clarks Fork of the Yellowstone River in Wyoming, and additions to the existing Smith Wild and Scenic River in northern California (table 13). Recommendations for designation of an additional 149 National Forest System rivers have resulted from forest planning and special river studies. An additional 326 rivers have been identified as having outstanding resource values and free-flowing characteristics, making them eligible for inclusion in the Wild and Scenic River System.

### Special Recreation Areas

The National Forest System contains 40 legislatively established special recreation areas, totaling more than 7 million acres: 16 national recreation areas, 5 national scenic areas, 4 national monuments, and 15 other areas. Two areas were added in FY

1991: Smith River National Recreation Area and Newberry Volcano National Monument.

### Wilderness

Recreation in wilderness accounted for 12.8 million recreation visitor days in FY 1991, 4.6 percent of the total recreation visitor days. The Forest Service manages 1 of every 6 acres of the National Forest System as wilderness, totaling approximately 33.6 million acres. During FY 1991, 322,229 acres were added to the National Wilderness Preservation System as a result of the Illinois Wilderness Act, which designated 25,549 acres, and the Tongass Timber Reform Act, which added 296,680 acres in Alaska (tables 14 and 15). There are 380 wilderness areas in the National Forest System in 36 States. Forest Service-managed wilderness represents 74.2 percent of the National Wilderness Preservation System, excluding those areas in Alaska, and represents 35.4 percent of the entire system including Alaska wilderness.

### Cultural Resources Management

During FY 1991, the "Windows On The Past" interpretive initiative greatly increased public participation and use of the cultural resources on the National Forest System. Through a "Windows On The Past" program called "Passport In Time," 600 volunteers contributed over 21,000 hours on 49 projects across the country, including archaeological excavation, historical reconstruction, oral history collection, and surveys. Over 1 million visitors attended cultural resource celebrations, another "Windows On The Past" interpretive project featuring displays and demonstrations about the prehistoric and historic resources on the National Forest System. "Windows On The Past" programs contribute directly to the 1990 RPA goal of enhanced recreation services and improved scientific knowledge about the natural and cultural resources.

Continued inventory and protection of significant sites increase knowledge of the cultural resources on Federal lands. During FY 1991, the Forest Service completed surveys on 1.2 million acres and identified over 12,000 historical or prehistoric properties. Of this number, approximately 9,500 were determined significant and 43 properties were submitted as proposals for listing to the National Register of Historic Places.

## LAW ENFORCEMENT

The Forest Service's law enforcement objective is to protect National Forest System visitors and their property, agency employees, National Forest System resources, and Federal property. Increasing numbers of individuals are using the National Forest System for illegal activities which include vandalism, archeological resource violations, timber theft, wildland arson, and the cultivation and manufacture of illegal drugs. Approximately 170 special agents and 600 uniformed law enforcement officers perform investigation and enforcement activities that are unique to the National Forest System.

*Rafting the Snake Wild and Scenic River through the Hell's Canyon National Recreation Area, Idaho.* Photo by Richard T. Nowitz

*Turn-of-the-century forest rangers provided both forest management and law and order for the surrounding communities.* F S. Photo

In FY 1991, approximately 510 Forest Service employees completed training in basic and advanced law enforcment sponsored by the Federal Law Enforcement Training Center (FLETC). The majority completed advanced classes to ensure the maintenance of high proficiency levels in agency law enforcement. The cooperative law enforcement program provided funding for agreements that allow the Forest Service to cooperate with State and local law enforcement agencies and with other Federal agencies. Mutual support between Forest Service law enforcement personnel and cooperating agencies provides visitors to the National Forest System a higher level of protection and service, even in remote areas.

During FY 1991, approximately 400 law enforcement agreements provided reimbursement to these cooperators for protecting visitors and their property. An additional 255 agreements provided State and local assistance to Forest Service drug control efforts on the National Forest System.

During FY 1991, nearly 83,000 violations of Federal laws and regulations were reported on the National Forest System, resulting in over $9 million in damages and losses to National Forest System property and resources. Violations included timber theft, arson, theft of archeological artifacts, vehicle-use prohibitions, occupancy and use violations, and health and safety hazards.

Drug activities on the National Forest System are a major concern, and affect the safety of visitors and employees. Forest Service drug control efforts are focused on the detection, apprehension, and prosecution of persons responsible for illegal drug activities on the National Forest System. In FY 1991, nearly 612,000 cannabis plants were eradicated from nearly 7,000 sites on the System. This reflects a 11-percent increase in plants

*A Forest Service law enforcement officer observes a tripwire near an illegal marijuana patch.* Photo by Jil Bauermeister

eradicated over FY 1990. In addition, 1,055 individuals were arrested for illicit controlled-substance production and distribution activities on the National Forest System. These drug enforcement efforts resulted in the seizure of several million dollars worth of assets and the destruction of several billion dollars worth of drugs.


*In 1912, a forest ranger and his 20-horsepower rail-adapted Ford roadster patrol for fires on the Sierra National Forest in California.* F.S. Photo

## FIRE AND AVIATION MANAGEMENT

Fire and aviation management activities on the National Forest System are under the leadership of the State and Private Forestry branch of the Forest Service.

### Wildfires on the National Forest System

The National Forest System is protected against wildfire with programs in fire prevention, fire presuppression, fire suppression, and fuels management. In FY 1991, Forest Service firefighting resources fought 9,723 fires on the National Forest System and provided firefighting assistance to other Federal and State organizations through interagency agreements.

### Fire Prevention

Two major fire prevention cooperative efforts had anniversaries in FY 1991. This was the 50th year that the Forest Service and the National Advertising Council worked together to bring a fire prevention campaign to the American public. The fire prevention messages were published in over 10,000 newspapers and 3,000 magazines, and broadcast by 9,000 radio stations and 7,500 television stations. This was the fifth year of the National Wildland/Urban Interface Fire Protection initiative, sponsored by the Forest Service, the National Fire Protection Association, the National Association of State Foresters, and the Bureau of Land Management.

### Presuppression

The Forest Service fields a firefighting force sufficient to provide efficient and effective initial attack on fires. The fire protection programs include detection, prevention, initial attack, and dispatching activities. Initial attack forces consist of smokejumpers, engine crews, highly trained "hotshot" crews, regular Forest Service employee crews, large- and medium-sized helicopters, and fixed-wing aircraft. In addition to the regularly funded Forest Service personnel, emergency fire crews are hired from local unemployment offices and trained for use on a call-when-needed basis, helping local economies while enabling people to engage in meaningful work.

All national forests and grasslands and the National Fire Management Analysis System determine their appropriate level of protection based on available funding. Their protection organizations are composed of lookouts, aerial detection patrols, fire prevention patrols, engines and crews, helicopters, dispatchers, and fire management personnel.

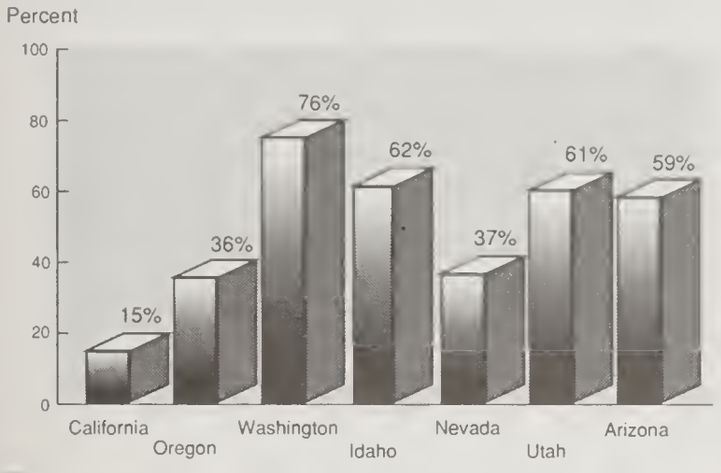
The Forest Service has 17 National Incident Management Teams, 9 fire caches as part of the National Fire Cache System (NFES), and a system of dispatch and coordination centers to facilitate quick and effective support for major wildfire activities. The agency is adopting interagency computer systems such as the Automated Resource Ordering System, National Automated Cache System, Aviation Management Information System, Weather Information Management System, and FireFly. FireFly is an advanced infra-red fire scanning system being developed by the National Aeronautics and Space Administration (NASA) at its Jet Propulsion Laboratory in California to assist in locating wildfires.

*Firefighters "mopping up" a forest fire.* Photo by Tom Iraci

### Suppression

Emergency suppression funds provide additional or extended firefighting resources beyond the planned, presuppression funded organization. In FY 1991, the Forest Service expended

Figure 29.
**Fire Severity Indicator—Spring Snowpack, FY 1991**




Normal = 100%

$188,942,000 in emergency suppression funds. Other Forest Service programs and cooperating agencies supply many other resources as the need for additional crews and other resources exceeds normal capabilities. Using other resources only when needed significantly reduces operating costs.

### National Mobilization

In FY 1991, only 7 large fires exceeded local management expertise, requiring National Incident Management Teams, as compared to 28 large fires in FY 1990. This reduction in national mobilization represents a high level of preparedness and response to a predicted severe fire season. The Boise Interagency Fire Center (BIFC) dispatched 1,717 supervisory personnel, 178 crews, and 545 tons of equipment to support local unit suppression efforts. Use of a coordinated fire center, such as BIFC, for all wildfires saves millions of dollars by eliminating redundant firefighting capacity.

### The 1991 Fire Season

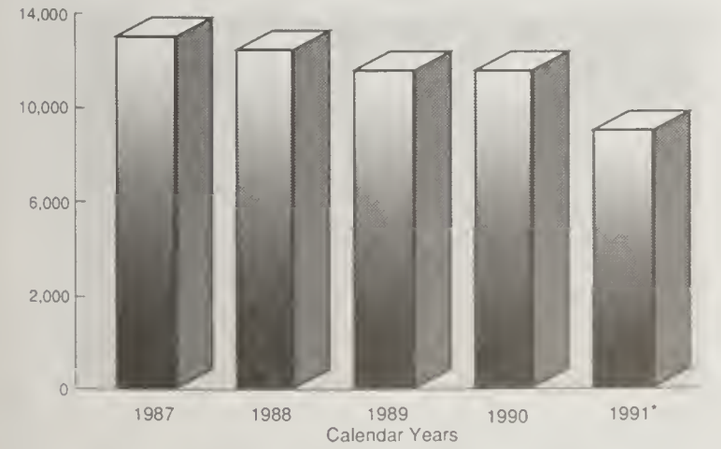
Drought in the Southeast contributed to the 21,000-acre "Shorts Fire" in the Okeefenokee Swamp in October 1990. Fortunately, subsequent abundant moisture in January through March reduced the fire potential, resulting in the least severe season in the Southeast in the past 10 years.

In the West, low spring snowpack (figure 29) indicated the fifth year of drought conditions and a potentially catastrophic fire season. Another concern was the effect of "Desert Storm" on the Nation's firefighting ability, including its affect on impacting the availability of military firefighters, and certain supply items normally obtained through the military, such as food rations and first aid supplies. Major fire activity started as early as April on the Black Hills and Custer National Forests in South Dakota and eastern Montana. Predictions of a severe fire season increased regional and national preparedness activities such as pre-positioning of aircraft, smokejumpers, and crews in high fire potential areas or where large amounts of lightning activity were expected.

### Emergency Severity Funding

As the 1991 fire season progressed, projections indicated worse than average conditions. In response, the Chief of the Forest Service authorized $32 million in severity funds to allow the hiring of additional crews, aircraft, and other fire suppression resources. While the total number of fires varied little from recent years (figure 30), a significant reduction in burned acres was achieved (figure 31), due in large measure to effective use of severity funding and strategic preparedness actions.

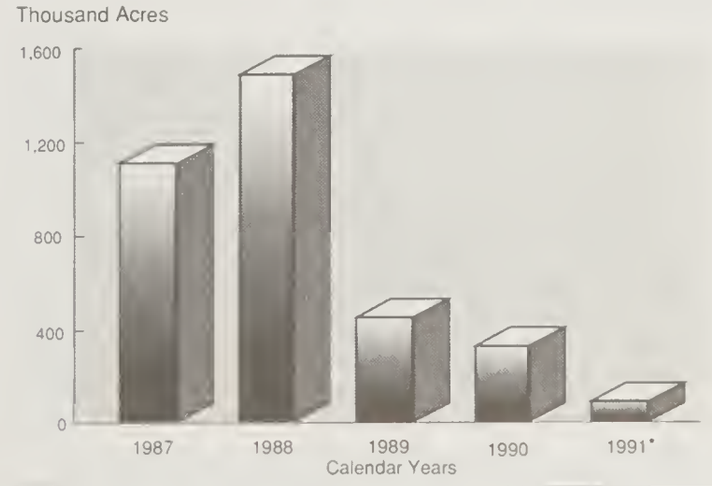
Figure 30.
**Number of Fires on the National Forest System**




| | 1987 | 1988 | 1989 | 1990 | 1991* |
|---|---|---|---|---|---|
| Number of Fires | 13,262 | 12,750 | 11,953 | 11,950 | 9,723* |

* Preliminary figure

Figure 31.
**Acres Burned by Wildfire on the National Forest System**




| | 1987 | 1988 | 1989 | 1990 | 1991* |
|---|---|---|---|---|---|
| Acres Burned | 1,163 | 1,550 | 476 | 346 | 98* |

* Preliminary figure

At the national level, 10 percent of the severity funds paid for additional aircraft and firefighters, early refresher training for smokejumpers, early activation of smokejumper aircraft, and reassignment of four airtankers from the Southwest to other parts of the country. A total of 166 additional crews were trained, 40 additional smokejumpers were added, and 9 additional helicopters were inspected and added to the national system. The regions used the remaining severity monies to add detection, initial attack, and dispatching forces. In addition, staffing of existing resources was extended to include every day of the week and some months outside the normal fire season.

### Fire and Emergency Funding Trends

Preliminary figures for FY 1991 show that while the number of fires declined to 81 percent of the FY 1990 figure, the burned acreage dropped to 28 percent of the previous year's total. In recent years, a downward trend in burned acreage (figure 31) and emergency expenditures (figure 32) accompanied an increase in severity funding (figure 33), while the number of fires changed little (figure 30). The firefighting organization, augmented by severity funded resources, controlled more fires to a smaller size.

### Fuels Management

Managing fuel (crushing, rearranging, burning, hauling away, etc.) reduces fire losses by making wildfire in treated areas easier to control and by reducing the rate of spread. Reduced rates of spread translate into smaller, less costly, and less damaging fires. Increased fuel loadings result from both management activities and natural processes.

Treating fuel resulting from Hurricane Hugo is an example of fuel management resulting from natural processes. Almost all of the 250,000 acres of the Francis Marion National Forest in South Carolina were affected. In FY 1991, wood was chipped and sold on 4,000 acres and prescribed fire was used on 20,000 acres. These management actions complemented earlier fuel break construction and protection of non-Federal lands. Nationally, 325,000 acres of accumulations from natural processes were treated on the National Forest System (figure 34 and table 16).

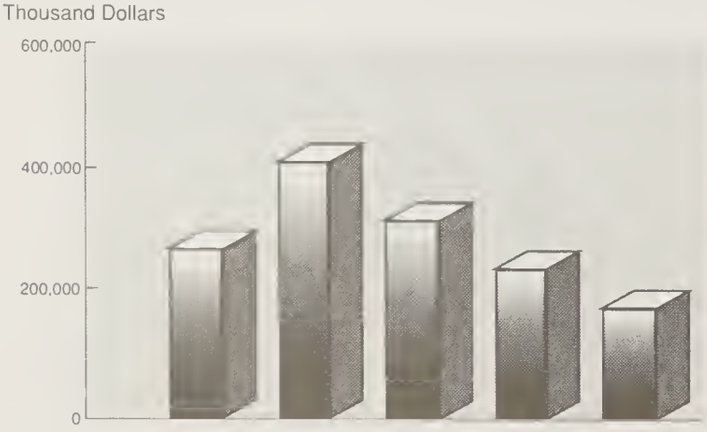
*Smokejumpers learn rapelling techniques.* Photo by R. Dale

### Aviation

In FY 1991, two DC-3 smokejumper aircraft were modified through conversion from reciprocating to turbine-type engines and were stationed in Missoula, Montana, and Ogden, Utah. The modified aircraft have less downtime (maintenance and repair), higher payload capacity, and can reach their destinations faster.

The Air Force transferred four C-23A "Sherpa" aircraft to the Forest Service; they were modified for smokejumper use and put

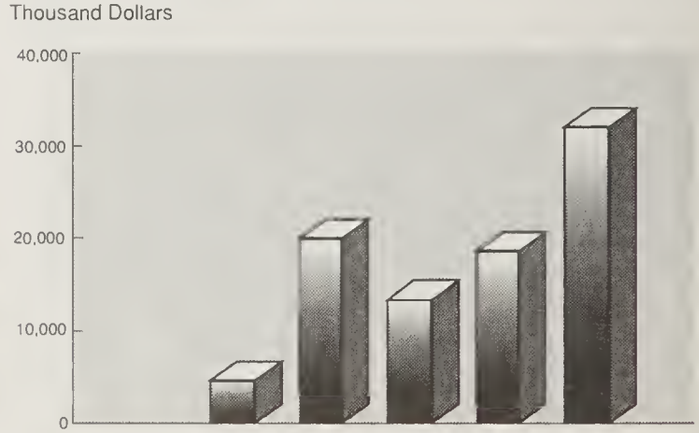
Figure 32.
**Fighting Forest Fires—Emergency Expenditures***




| | (Thousand Dollars) | | | | |
|---|---|---|---|---|---|
| Actual Expenditures | 288,492 | 435,588 | 335,485 | 253,683 | 188,942 |

*Includes severity authorizations

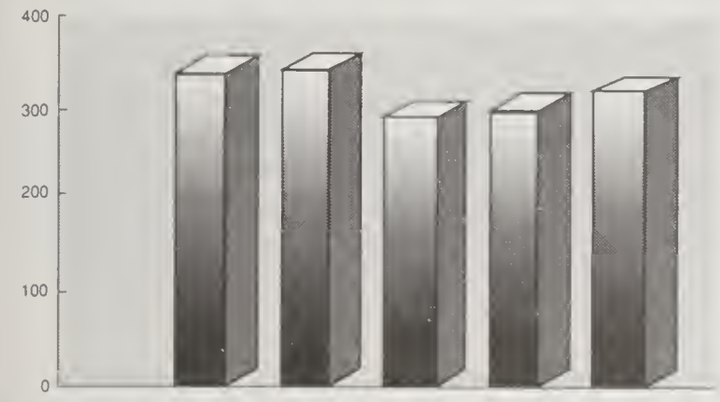
Figure 33.
**Severity Authorizations**




| | (Thousand Dollars) | | | | |
|---|---|---|---|---|---|
| Actual Authorizations | 4,754 | 20,250 | 13,455 | 18,890 | 32,207 |

* Preliminary figure

Figure 34.
**Acres of Fuels Treatment Accomplished—National Forest System**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Acres Treated | 345 | 347 | 296 | 305 | 325 |

in service. The Sherpas can carry 50 percent more smokejumpers and gear than the Twin Otters they replaced.

The Forest Service contracts for airtankers that deliver fire retardant chemical and water mixtures to fires. The Forest Service has worked to assist contractors in obtaining newer, faster, and higher capacity aircraft. Of the 30 airtankers contracted in FY 1991, 9 were the newer P-3A and C-130A aircraft.

*Sherpa aircraft awaits taxi instructions at the Aerial Fire Depot in Missoula, Montana.* Photo by Bob Beckley

## FOREST PEST MANAGEMENT

Forest Pest Management activities on the National Forest System are under the leadership of the State and Private Forestry branch of the Forest Service, and provide protection from insects and diseases on all Federal and non-Federal lands. Surveys, evaluations, and prevention and suppression activities on the National Forest System are described below. Pest management activities that benefit other land areas are described in State and Private Forestry, Chapter 3.

### Surveys and Technical Assistance

Aerial and ground surveys detected and evaluated vegetation damage or pest populations on 132 million acres of the National Forest System. Survey findings, along with recommendations and advice about suppression needs and available alternatives, were provided to the managers of affected lands.

*DC-3 turbo flying over Lake McCall, Idaho.* Photo by Jim Kautz

### Pest Outbreak Prevention and Suppression

Using the bacterial insecticide *Bacillus thuringiensis*, the Forest Service conducted gypsy moth, *Lymantria dispar*, suppression projects totaling 5,400 acres, on the Huron-Manistee National Forest (Michigan, 1,600 acres), and on the George Washington National Forest (Virginia and West Virginia, 3,800 acres).

A 17,700-acre gypsy moth eradication project was required in Utah on the Uinta (4,500 acres) and Wasatch-Cache (13,200 acres) National Forests, in conjunction with a 12,200-acre project on intermingled and adjacent State and private lands. Two applications of *Bacillus thuringiensis* were used.

The Forest Service performed southern pine beetle, *Dendroctonus frontalis*, suppression activities such as salvaging infested trees, cut-and-leave harvesting, and piling and burning infested logging slash on approximately 5,300 acres of National Forest System lands. Seven national forests were treated in areas from North Carolina to Texas. Suppression activities protected about 12.9 million cubic feet and salvaged an additional 9 million cubic feet of pine timber.

Suppression of mountain pine beetle, *Dendroctonus ponderosae*, was performed on 57,500 acres by harvesting, baiting and harvesting, or baiting and burning on 18 national forests. The forests are in California, Colorado, Idaho, Montana, Utah, and Wyoming.

*Gypsy moths.* USDA Photo

Approximately 2.9 million cubic feet of timber were protected, and an additional 0.7 million cubic feet of timber were salvaged.

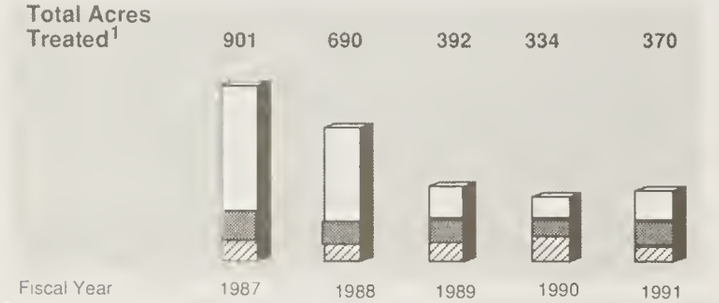
A Douglas-fir tussock moth, *Orgyia pseudotsugata*, suppression project covered 114,000 acres of the Wallowa-Whitman National Forest in Oregon. *Bacillus thuringiensis* was used. The project protected about 22.6 million cubic feet of merchantable timber.

### Pesticide Use

The RPA Act (Sec. 3 (e)) requires that the use of pesticides on the National Forest System be reported annually.

In FY 1991, 269,674 acres, less than 0.2 percent of the total acreage of the National Forest System, were treated with pesticides (figure 35). Treatments for insect and disease control included insecticides, fungicides, and fumigants. Vegetation management treatments were with herbicides. Animal damage control was accomplished with predacides, piscicides, rodenticides, and repellents (table 17).

Figure 35.
**Pesticide Use on the National Forest System**




(Thousand Acres)

| | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Insect and Disease Prevention and Suppression | 641 | 485 | 170 | 110 | 162 |
| Vegetation Management | 151 | 116 | 121 | 96 | 122 |
| Animal Damage Control | 109 | 88 | 101 | 128 | 87 |

[1]Numbers may not add due to rounding.

## FOREST MANAGEMENT

Forest management on the National Forest System includes inventory of forest resources, reforestation, care of forest vegetation, and harvest of trees in a manner that ensures environmental quality and meets a variety of forest plan objectives for wood products, wildlife habitat, water quality, and recreation settings.

*A 1902 felling crew poses in a Douglas-fir, near Sedro Woolley, Washington.* Photo by D.R. Kinsey

### Forest Vegetation Resource Inventory

In FY 1991, the Forest Service inventoried 16,500,000 acres, with a primary focus on old-growth forests. Forest vegetation resource inventories provide information needed to compile land classification, determine timber volume, and monitor growth rates. Information is also gathered for forest plans and to provide a measure to evaluate changes during the planning period. In addition, this

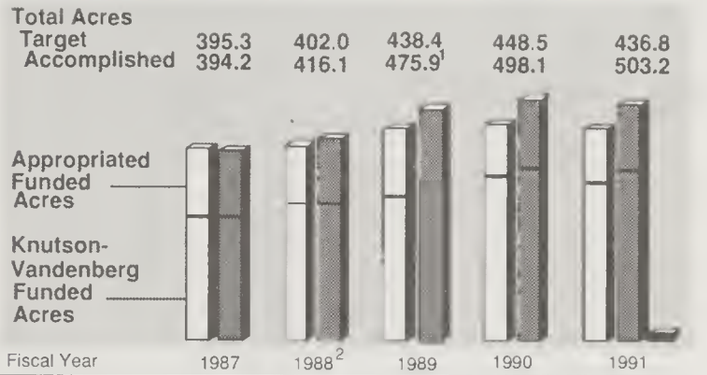
information is used for research publications and for the national assessment program required by the Forest and Rangeland Renewable Resources Planning Act (RPA).

### Silvicultural Examinations

In FY 1991, the Forest Service completed silvicultural examinations on 5.3 million acres. These examinations provide data on existing ecological habitat, tree stand conditions (age, size, health, and vigor) and capabilities, growth, and mortality trends on a given site. Data from examinations are used to develop site-specific, integrated resource prescriptions to meet forest plan objectives.

*A forest technician inventories an old-growth stand on the Willamette National Forest in Oregon.* Photo by Ken Hammond

Figure 36.
**Reforestation**




(Thousand Acres)

| | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Target | | | | | |
| Appropriated | 139.7 | 119.0 | 142.1 | 109.9 | 114.0 |
| K-V | 255.6 | 283.0 | 296.3 | 338.6 | 322.8 |
| Accomplished | | | | | |
| Appropriated | 139.4 | 133.3 | 148.6 | 145.0 | 138.2 |
| K-V | 254.8 | 282.8 | 327.3 | 353.1 | 350.5 |
| Contributed | | | | | 14.5[3] |

[1] An additional 16,350 acres were reforested with contributed funds and were included in table 13.
[2] Does not include 36,800 acres of natural regeneration without site preparation.
[3] Acres reforested with funds contributed from outside sources.

### Reforestation

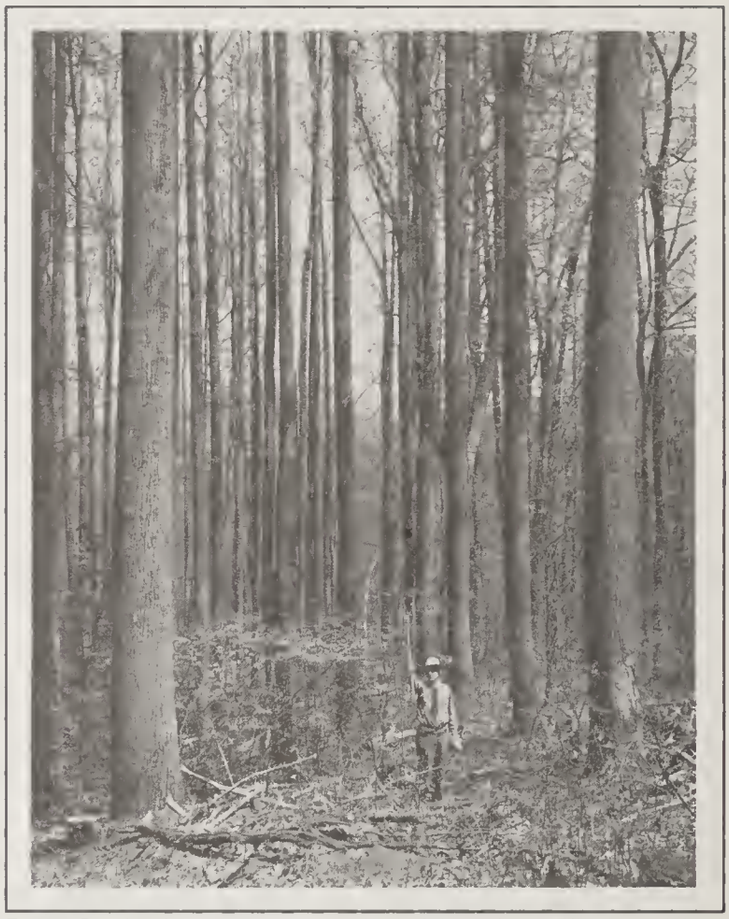
In FY 1991, the Forest Service reforested 503,000 acres (figure 36, table 18), with over 50 different species of trees. Forest Service reforestation accomplishments continue on a record high level. This level of reforestation is in recognition of the need to rehabilitate the large amount of acres that were devastated by the severe fires from 1987 to 1989, to meet the program objectives outlined in the 1990 RPA Program, and complement the President's America the Beautiful efforts. Appropriated, Reforestation Trust, and carry-over funds reforested 138,200 acres; 14,500 acres were accomplished with contributed funds; and the Knutson-Vandenberg Act funds reforested 350,500 acres. Natural regeneration occurred on 142,313 acres and is included in the above numbers.

Over the past 5 years, an average of 90 percent of all reforestation has successfully met stocking objectives. Understocked plantations will be replanted to ensure adequate stocking levels. The currently understocked area on the national forests needing reforestation totals 1,115,000 acres, a decrease of 29,000 acres (tables 19 and 20) from FY 1990. Tables 21 and 22 display reforestation acres, by States and regions, respectively, certified as being satisfactorily stocked. The 1990 RPA Program projects a 16-percent decrease (base year 1990) in reforestation needs by 1995, with reforestation projected to rise slightly between 1995 and 2040, but to remain at less than FY 1990 levels.

### Tree Nursery Operations

Ten Forest Service tree nurseries produced 135.0 million seedlings—130.8 million bareroot and 4.2 million container seedlings—for reforestation. The seedling production costs are charged to the Working Capital Fund which, in turn, is repaid as a cost of seedlings by the reforestation program for the individual national forests. Contracts with State and private nurseries supplied the Forest Service with an additional 29.3 million seedlings.

*A volunteer, participating in a cooperative project, replants in a harvest area on the Sierra National Forest in California.*
Photo by S. Dunsky



*Forest Service forester measures the height, using a Biltmore stick, of a tall yellow poplar on the Chattahoochee National Forest, Georgia, in 1949.* F.S. Photo

To improve forest tree growth characteristics and disease resistance, the Forest Service maintains a tree improvement program. Seeds are collected from selected national forest trees that have natural superior growth or disease resistance and from tree seed orchards that produce genetically superior seedlings for outplanting on the national forests.

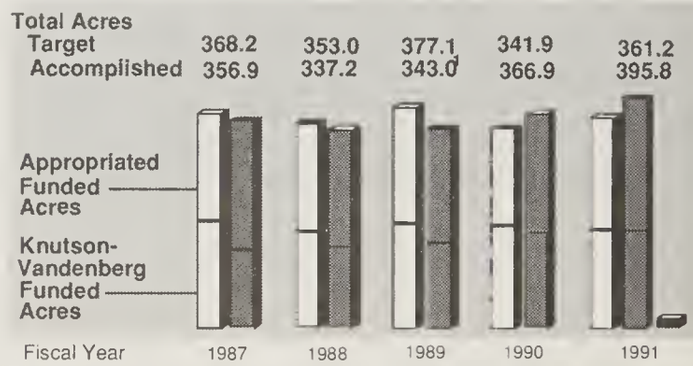
Timber yields may be increased by 10 percent on national forests reforested with genetically improved planting stock. The 5,127 pounds of seed harvested from seed orchards in FY 1991 was 23 percent of the total seed collected by the Forest Service. During FY 1991, 21 percent of the acres planted on the National Forest System were planted with seedlings grown from seeds obtained from seed orchards.

### Timber Stand Improvement

Timber stand improvement treatments were applied to a total of 395,800 acres (figure 37, table 23). Appropriated and carry-over funds were used for treating 226,400 acres, contributed funds treated 2,100 acres, and Knutson-Vandenberg Act funds treated 167,300 acres. The 1990 RPA Program projects a 12-percent decrease (base year 1990) in timber stand improvement by 1995. Treatment acres are projected to initially rise slightly after 1995, remaining below 1990 levels, and then to gradually decrease toward 2040.

Table 24 provides detailed information on timber stand improvement acre needs, and table 25 summarizes the data.

Figure 37.
**Timber Stand Improvement**

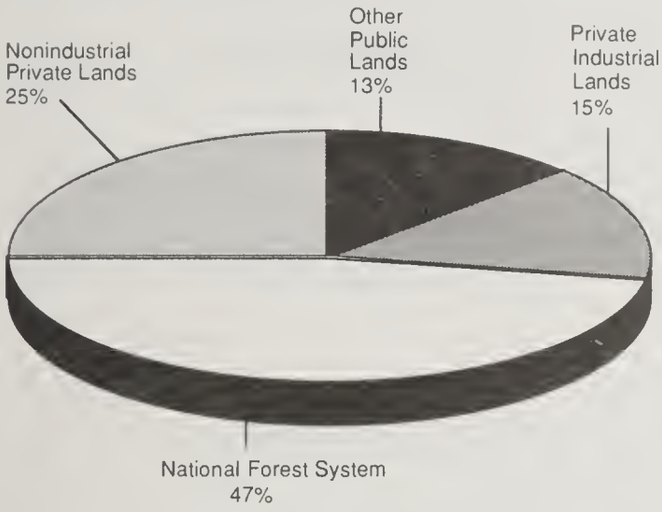



(Thousand Acres)

| | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Target | | | | | |
| Appropriated | 185.8 | 187.0 | 197.6 | 166.8 | 191.4 |
| K-V | 182.4 | 166.0 | 179.5 | 175.1 | 169.8 |
| Accomplished | | | | | |
| Appropriated | 222.7 | 199.0 | 196.9 | 200.3 | 226.4 |
| K-V | 134.2 | 138.2 | 146.1 | 166.6 | 167.3 |
| Contributed | | | | | 2.1[2] |

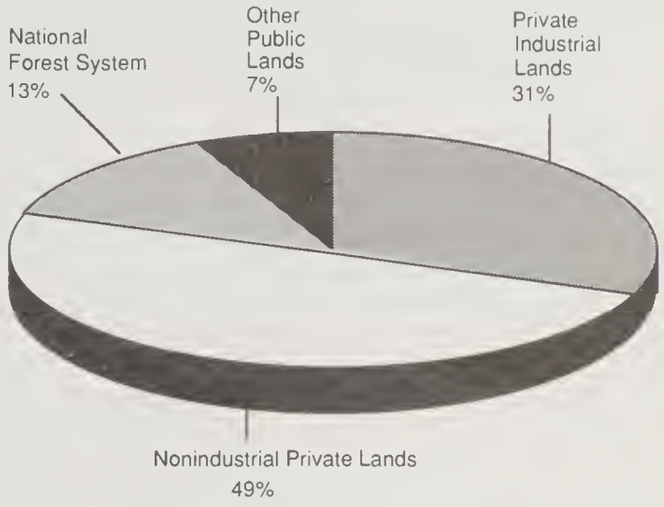
[1] An additional 3,278 acres were accomplished with contributed funds and were included in table 18.
[2] Acres accomplished with funds contributed from outside sources.

Figure 38.
**Inventory of Standing Softwood Sawtimber by Ownership**[1]




[1] Data taken from "Forest Statistics of the United States, 1987." PNW-R8-168

Figure 39.
**Percentage of Total Annual Wood Harvested from Lands in the United States**[1]




[1] Data taken from "Forest Statistics of the United States, 1987." PNW-R8-168

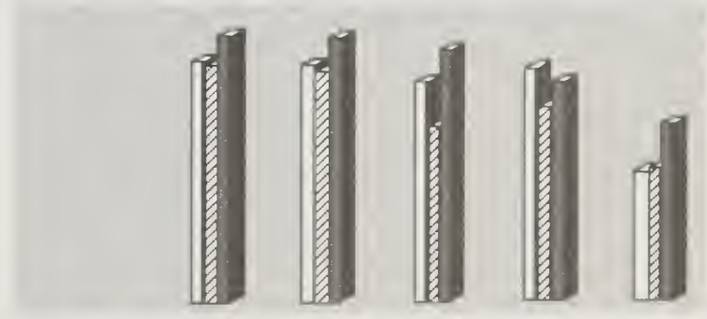
### Timber Sale Preparation, Offering, and Harvest

The National Forest System contains 47 percent of the Nation's standing softwood sawtimber inventory (figure 38). However, of the Nation's softwood sawtimber volume used for lumber in FY 1991, the National Forest System contributes approximately 19 percent. Overall, the National Forest System provided 13 percent of the total wood volume harvested in the United States in FY 1986 (the last year data was available). This compares with 49 percent from nonindustrial private forest lands, 31 percent from private industrial lands, and 7 percent from other public lands (figure 39).

In FY 1991, the Forest Service sold 6.4 billion board feet (BBF) (1.2 billion cubic feet (BCF)), including volume offered in FY 1990 that was sold in FY 1991. This is 67 percent of the funded target of 9.5 billion board feet (1.8 BCF) of timber offered for sale. The Forest Service offered 6.2 billion board feet (1.2 BCF) for sale in FY 1991. The decreased accomplishment level for volume offered was due to Forest Service management actions in response to environmental concerns relating to old-growth forests, the northern spotted owl, the red-cockaded woodpecker, and actions related to administrative appeals and litigation. At the end of FY 1991, Servicewide, 130 timber sales were under administrative review, 81 of which are stayed until the review is resolved. The average amount of time needed to reach resolution on an administrative review of a timber sale decision is 102 days. In FY 1991, approximately 466 million board feet of the Forest Service's planned timber sale target was not met due to delays caused by administrative reviews. An additional 1,371 million board feet were not sold because of litigation.

Sale volume includes green timber, salvage timber, and firewood. Figure 40 displays total timber offered, sold, and harvested; and figure 41 displays timber offered, sold, harvested and under contract by Forest Service region. Table 26 displays the timber offered, sold, and harvested for fiscal years 1987-91. Table 27 provides information, by region, on timber offered, sold, and harvested. Table 28 displays timber sold and offered by each State for FY 1991. Table 29 displays number of sales, volume, and value of timber sold by size class for FY 1991. Table 30 displays, by region, uncut timber volume under contract. The 1990 RPA Program projects a 3-percent decrease (base year 1990) in timber offered by 1995, with offer levels projected to rise 8 percent between 1995 and 2040.

Figure 40.
**Timber Offered, Sold, and Harvested**



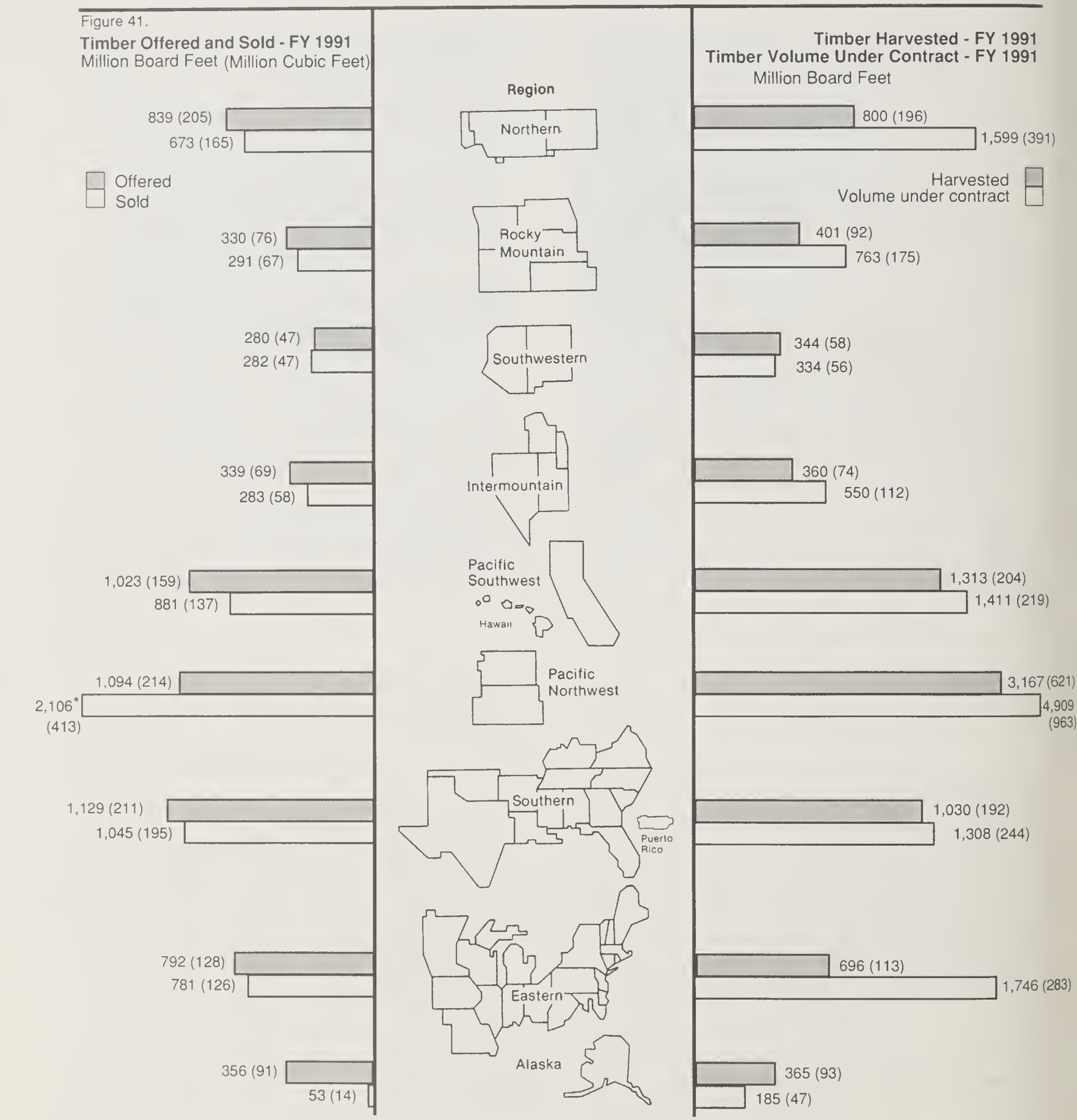
| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Billion Board Feet) | | | | |
| Offered | 11.5 | 11.3 | 10.5 | 11.1 | 6.2 |
| Sold | 11.3 | 11.0 | 8.4[1] | 9.3 | 6.4[2] |
| Harvested | 12.7 | 12.6 | 12.0 | 10.5 | 8.5 |

[1] Appeals, litigations, and Spotted Owl Temporary Restraining Order delayed the offer and award of new sales in Regions 5 and 6.
[2] Includes volume offered in FY 1990.

Figure 41.

**Timber Offered and Sold - FY 1991**
Million Board Feet (Million Cubic Feet)

**Timber Harvested - FY 1991**
**Timber Volume Under Contract - FY 1991**
Million Board Feet




Total Uncut Timber Under Contract—12,805 Million Board Feet (2,440 Million Cubic Feet)

*Due to delays for spotted owl decisions and for the need to complete purchaser qualification reviews, over 1.0 BBF of timber offered for sale in FY 1990 was awarded and sold in FY 1991 in the Pacific Northwest Region.

Funding levels for the Forest Service timber program are displayed in table 31.

The Forest Service's timber sale revenues continue to exceed program costs. In FY 1991, timber sale costs, including roads, were $685 million; timber harvest revenues were $1.158 billion (table 32).

The Forest Service has shifted its reliance on the use of clearcuts as a regeneration technique. The shift is to other even-age regeneration methods and to uneven-age regeneration methods. Clearcuts decreased 19 percent from FY 1990 to FY 1991, due primarily to the reduction in volume offered.

### Salvage Sale Program

In FY 1991, the Forest Service sold 1,483 million board feet (288 million cubic feet) of salvageable timber. This volume is part of the total FY 1991 sale volume. Small timber operators (those with fewer than 25 employees) purchased approximately 4 percent of the timber sold under the salvage sale program. Salvage sale revenues cover the costs of preparing and administering sales of insect-infested, dead, damaged, or downed timber, including the engineering costs for roads.

In recent years, salvage sale offerings stemmed from the catastrophic forest fires in the West, insect attacks in the northern Rocky Mountains and portions of the South, and tree mortality from prolonged drought conditions in the Sierra Nevada Mountains.

### Timber Sale Program Information Reporting System (TSPIRS)

The National Forest Management Act (1976), Section 6(1), requires the Forest Service to estimate the long-term costs and benefits of the agency's timber sale program. Prior to the development of TSPIRS, this requirement was met through the analysis of a sample of timber sales. TSPIRS more completely meets the Section 6(1) requirement by providing the total estimated long-term benefits and costs of all national forest timber sale programs.

Substantial modification was made to the Timber Sale Program Information Reporting System (TSPIRS) in FY 1991. Based on two audits of the system, by the General Accounting Office (GAO) and Brown and Company (an independent accounting firm), several recommendations were suggested to bring the TSPIRS Statement of Timber Sale Revenues and Expenses into conformance with generally accepted accounting principles and Title II of the GAO Policies and Procedures Manual for Guidance of Federal Agencies. In addition, Congress requested that the report include more detailed cost information. Reports for FY 1989 and FY 1990 have been revised to provide comparable information. The reporting system's official results for FY 1991 display a statement of timber sale revenues and expenses (table 32), employment, income, and program level account (table 33), and the economic account (table 34).

### Below-Cost Timber Sale Program Policy

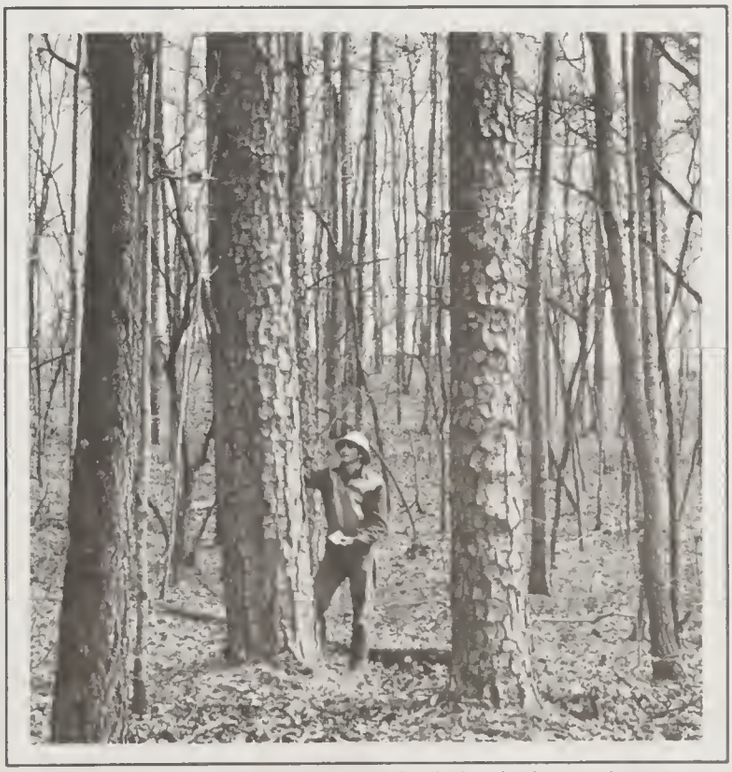
On April 16, 1991, the Forest Service published in the Federal Register the proposed policy to address the issue of below-cost timber sale programs. The policy was issued as interim direction, and further public comment has been requested.

### Timber Exports

The Forest Resources Conservation and Shortage Relief Act of 1990 was signed by the President on August 20, 1990. The act makes permanent the current restrictions on export of Federal logs and, except for some limited exceptions, bans both direct and indirect substitution of Federal logs for exported private logs from lands west of the 100th meridian in the contiguous 48 States. The act provides for establishment of surplus species, and sourcing area boundaries and sets significant penalties and administrative remedies for violations.

The Forest Service published a notice of statutory restrictions in the Federal Register on September 17, 1990 (55 FR 36123), followed by publication of an interim rule on November 20, 1990 (55 FR 48572). Two proposed rules were published in the Federal Register on January 29, 1991 (56 FR 3354 and 56 FR 3375).

The Department's Chief Administrative Law Judge has completed hearings and issued decisions on sourcing area applications received on or before December 20, 1990. Of the 42 separate areas ruled on, 30 were approved and 12 were denied. Of the 12



*A forester in 1950 measures and marks timber in the southeastern United States.* F.S Photo

applications denied, nine will be awarded the sourcing areas recommended by the Forest Service following the applicants' certification to cease exporting from the recommended area. The remaining three applications were given bench rulings, followed by a written decision and order.

### Excess Timber Receipts

The 1989 Department of the Interior and Related Agencies Appropriations Act (Public Law 100-446) required all timber receipts in excess of $791 million be made available (until expended) to the Secretary of Agriculture for additional improvements in specific resources on the National Forest System. Under this provision, $97.5 million were available in FY 1989. At the end of FY 1990, the fund balance remaining to be expended was $10.8 million. The balance of the work was accomplished in FY 1991.

### Cubic Measurement

Working with specialists in the timber industry, the Forest Service continued progress in developing a cubic measurement system to replace the board-foot measurement system to measure timber. This cooperative effort led to the development of a Cubic Foot Log Scaling Rule, which the Forest Service will use as it converts timber sale processes from board-foot units to cubic units over the next several years.

*Gathering jojoba beans in Arizona. Jojoba beans are collected for the very fine oil they produce.* Photo courtesy of M Turner, Jojoba Happenings.

Cubic measurement is a consistent and constant unit of measure —one that is simpler and fairer than the board-foot unit because it is free from "rules of thumb" and adjustment factors and is easier to understand. It also reduces sampling and measuring costs of standing and harvested timber, and it can be applied to all wood products, not just lumber.

### Firewood and Other Forest Products

The National Forest System provided 1.1 million cords of firewood for personal use—a value of $4.98 million. This volume is part of the total FY 1991 sale volume. For many individuals and families, gathering firewood provides not only an energy alternative but also an enjoyable outdoor recreation experience. Firewood is measured, appraised, and sold in standard 128-cubic-foot cords, containing about 80 cubic feet of wood. The firewood sales program works on a charge system; fees cover administrative and management costs.

The National Forest System offers users a wide variety of forest products. Round wood products, such as house logs, poles, posts, and fence rails, are provided to many users for commercial or personal purposes on an individual piece basis or per linear foot. Bolts of cedar and other rot-resistant species that can be split into roofing shingles are sold by the cord.

There is a popular demand for Christmas trees, both cut and dug for later planting, and as a traditional recreation experience. Christmas trees and "wildings" used in landscaping are sold on an individual tree basis. Cedar boughs are sold by the ton, as are various ferns and evergreen brush species used by the floral industry. Some National Forest System products such as pinyon nuts, jojoba beans, bear grass, and mushrooms are sold by the pound. The bark of several tree species, such as the cascara tree and Pacific yew, which is used for medicinal purposes (see below), is sold by weight. Sap tapped from the trunks of various tree species is sold by the gallon for such diverse products as naval stores, maple syrup, and spruce gum. Dried cones, used for decorative purposes, are sold by the sack or by the bushel.

### Pacific Yew—A Source of the Anti-Cancer Drug Taxol

Taxol, a chemical extracted from Pacific yew, *Taxus brevifolia*, is an extremely effective anti-cancer drug. Patients with ovarian cancer have shown a 30-percent response rate (tumor shrinking) to taxol treatment even when they had previously shown no response to other treatments. Recent data suggest that the response rate for treating breast cancer will also be significant. Clinical trials are currently in progress for other types of cancer, on a very small scale because of the extremely limited supply of taxol; similar positive results are expected. Taxol is expected to be a major cancer-treating chemical. This will require a large and steady supply of the raw material—Pacific yew bark. Attempts to produce synthetic taxol have not yet been successful, although taxol-like compounds extracted from yew have been converted to taxol.

Following the signing of a Cooperative Research and Development Agreement (CRADA) by the National Cancer Institute (NCI)

and Bristol-Myers Squibb Company (BMS), the Forest Service and BMS developed a cooperative agreement that provides the framework for ensuring that the Pacific yew resource is used effectively. A memorandum of understanding was signed by the Secretaries of Agriculture, Health and Human Services, and the Interior in June 1991 to ensure cooperation in the development of taxol. In FY 1991, in order to meet the NCI's urgent need, approximately 825,770 pounds of dry Pacific yew bark were collected from the National Forest System in Oregon, Washington, Montana, and Idaho.

The National Cancer Institute and the Forest Service are working together on short- and long-range approaches to ensure the taxol supply from Pacific yew. Interim collection guidelines were developed for national forests in Oregon and Washington to respond to NCI's current needs for Pacific yew bark, while ensuring that the Pacific yew remains a viable component of Pacific Northwest forests. The NCI has extracted taxol from the bark and needles of 510 trees sampled across the range of Pacific yew. These same trees are being propagated at Forest Service nurseries and analyzed for genetic variation at the Forest Service Genetic Electrophoresis Laboratory. The Forest Products Laboratory is conducting research on extracting taxol from heartwood; its efforts may lead to an additional supply of taxol. The Pacific Northwest Research Station has also initiated research on the silviculture, ecology, and management of the Pacific yew.

*A Basque sheepherder participates in a range study where goats are used to eradicate the noxious weed, Leafy Spurge.*
Photo by Jill Bauermeister

*A forester at the Forest Service's Coeur d'Alene Nursery in Idaho holds yew seedlings in front of a fully mature tree.*
Photo by Jeffrey Tinsley

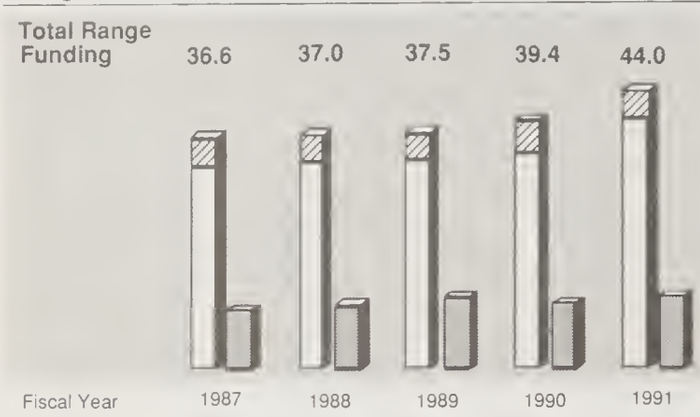
## RANGELAND MANAGEMENT

The Forest Service administers livestock grazing permits on over 99 million acres in 33 States. In addition, healthy rangelands provide quality wildlife habitat, stable soils, and clean water, both inside and outside of grazing allotments.

Concerns over the health of the range, effects of grazing by livestock and big game, the spread of noxious weeds, effects of forest plan implementation, and the need to increase cost effectiveness present unique challenges to public land managers. In concert with the 1990 RPA Program theme to ensure that commodity production is environmentally acceptable, the Forest Service continued its "Change on the Range" initiative, which has been in place for 5 years, in an effort to gain a broader view of rangeland management. Special emphasis is given to restoration of rangeland riparian areas, improved rangeland condition, and more partnerships with interested groups and individuals. Management activities ensure that watersheds are protected, soil productivity is maintained, and ecological objectives which consider varied interests are implemented.

The rangeland program was funded at $39.5 million (including the Range Betterment Fund) in FY 1991, and returned $11.5 million to the Treasury from grazing fees (figure 42). Grazing fees are calculated differently for three major areas of the country. In FY 1991, fees were $1.97 per head month for the national forests in the 16 Western States, were $3.58 per head month for the national grasslands in the 9 Great Plains States, and ranged from $1.08 to $4.42 per head month for the national forests in the East.

Figure 42.
**Range—Funding and Receipts**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Million 1991 Dollars) | | | | |
| Range Management Funding | 32.2 | 32.9 | 33.1 | 34.3 | 39.5 |
| Range Betterment Funding | 4.4 | 4.1 | 4.2 | 5.1 | 4.5 |
| Grazing Receipts | 9.4 | 9.8 | 11.8 | 10.6 | 11.5 |
| Receipts as Percentage of Funding | 26 | 26 | 32 | 27 | 26 |

Rangeland acres are classified as either suitable or unsuitable for livestock grazing, with about 50 million acres classified as suitable. Unsuitable lands are areas within allotments that do not significantly add to the forage base. Acres classified as unsuitable could include land that was too steep, areas lacking forage in heavily timbered or rocky sites, or areas too distant from water.

Noxious weeds infest 4.9 million acres of the National Forest System in the Western States. Weeds negatively affect many resource conditions and characteristics. The control of noxious weeds requires coordinated efforts by all landowners in an infested area. In FY 1991, local weed control districts and the Forest Service worked together to treat 44,958 acres of the National Forest System, exceeding the targeted accomplishment by 13,327 acres.

Over 2,600 wild horses and burros graze on the National Forest System. In FY 1991, 580 wild horses and burros were captured and made available for adoption in an effort to manage the herds within the capacity of the range to ensure satisfactory rangeland conditions.

### Livestock Grazing

In FY 1991, the Forest Service administered 10,000 paid permits (tables 35 and 36) for 9.5 million animal unit months (AUM's) of grazing by domestic cattle, horses, sheep, and goats (tables 37 and 38). Total permitted AUM's are expected to continue to decline slightly as forest plans are implemented that focus on multiple use with a different balance of resource values and

*Cattlemen move a herd of Longhorns in 1950.* F.S. Photo

outputs than in past years. The range program continues to implement improved management on grazing allotments and other rangelands that contribute to improved rangeland conditions, which resulted in reduced stocking levels on some allotments during FY 1991.

Competition between big game and livestock for space and forage is an issue in the Western States. The effectiveness of forest plans in dealing with livestock-big game conflicts was reviewed in May 1990. Action plans were developed for each western Forest Service region. Action items include working closely with State agencies to develop big game herd objectives that are consistent with forest plan standards and guidelines. In FY 1991, the Forest Service co-hosted a national Livestock-Big Game Symposium in Sparks, Nevada, along with 12 interest groups. The purpose was to focus on building partnerships and developing positive solutions that have a broad base of support.

*Cattle graze alongside an active oil well on the Custer National Grasslands in North Dakota.* Photo by Jill Bauermeister

**Rangeland and Riparian Conditions**

Approximately 73 percent of the 50 million suitable acres in allotments are in satisfactory condition. Satisfactory condition means forest plan standards and guidelines have been met or a positive trend is displayed.

Management is key to improving or maintaining rangeland in satisfactory condition. Approximately 3,737 structural improvements such as fences and water developments were constructed in FY 1991 to achieve proper management. This exceeded targeted accomplishment by 899 structures. Forage improvement work such as prescribed burning, seeding, and mechanical treatments was accomplished on 109,127 acres. This exceeded targeted accomplishment by 34,127 acres.

Knutson-Vandenberg (K-V) Act funds covered the costs of 13 percent of the structures and forage improvements. Knutson-Vandenberg funds are timber sale revenues spent on range improvements done within timber sale boundaries. In addition, the Forest Service accomplished 359 high-priority structural improvements and 2,741 acres of forage improvements with labor, funds, and materials donated by cooperating permittees, other agencies, and volunteers.

*Range conservationists study the health of the riparian zone following streambank restoration on the Sawtooth National Forest in Idaho.*
Photo by Jim Hughes

The Forest Service co-hosted two national Range Workshops in FY 1991, demonstrating the Chief's commitment to "Change on the Range" initiatives. The American Farm Bureau Federation and the Forest Service jointly produced a video, "In Harmony With the Range," to increase public awareness of successful rangeland management.

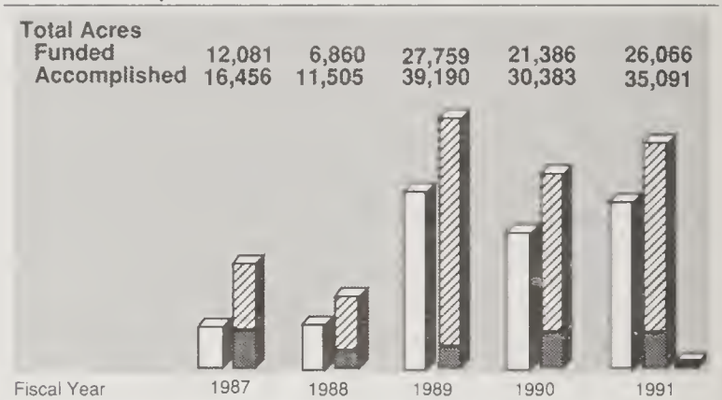
## SOIL, WATER, AIR, AND WEATHER MANAGEMENT

### Stewardship

The Forest Service soil, water, and air management goal is to ensure that the National Forest System is managed in an environmentally sensitive manner, giving first preference to protection of the basic soil, water, and air values while still producing the forage, minerals, timber, and other uses of these lands.

One of the long-standing Forest Service challenges is the healing and restoration of acquired abandoned farm and other owned lands, especially in Appalachia. Since the 1930's, many thousands of acres of such watersheds have been stabilized by tree planting and erosion control measures. As a result, water quality improves, soil erosion is lessened, and channels begin to cleanse themselves of accumulated silt. The 1990 RPA Program placed emphasis on improving damaged watershed resources to a level of minimal soil loss, providing favorable water flows to downstream users, reducing floods, and generating a sustained yield of resources while protecting the environment.

Figure 43.
**Watershed Improvements—Acres**




| | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Acres Funded | | | | | |
| Appropriated | 6,738 | 6,860 | 27,759 | 21,386 | 26,066 |
| Acres Accomplished | | | | | |
| Appropriated[1] | 10,413 | 8,683 | 35,832 | 24,779 | 28,788 |
| K-V | 6,043 | 2,822 | 3,358 | 5,604 | 5,635 |
| Contributed | | | | | 668[2] |

[1] Includes excess timber receipt and other acres.
[2] Acres accomplished with funds contributed from outside sources.

*Erosion problems, in 1937, on the Hoosier National Forest in Indiana.* Photo by W.H. Schaffer

### Soil Resource Inventories

In FY 1991, soils were inventoried on 18.7 million acres, compared with 6.7 million acres in FY 1990. The inventory is now about 60 percent complete, but at the current pace, the 1990 RPA Program goal of inventorying all of the National Forest System by the year 2000 will not be met.

There is a growing trend to take more of an ecological approach to soil inventories. This approach adds vegetation and sometimes hydrologic information to the soils data, making ecological interpretations easier and more reliable. For example, the Targhee and Bridger-Teton National Forests each used ecological inventory crews in FY 1991 to classify ecological types and design ecological unit maps.

### Long-Term Soil Productivity Study

The Forest Service is establishing soil quality threshold standards for soil compaction and organic matter content which will serve as benchmarks to guide forest practices, monitor trends in soil conditions, and assess the effectiveness of soil and water conservation practices. This major effort involves four regions and five research stations. In FY 1991, study plots were installed in Louisiana, North Carolina, California, Minnesota, and Idaho. Universities, other agencies, Canada, and New Zealand are also showing considerable interest in this study.

*North Carolina Wildlife Resources Commission employee and a co-op student with the Forest Service watch a vehicle spread lime on the impound area at Catfish Lake on the Croatan National Forest.*
Photo by Ken Hammond

### Soil and Water Resource Improvement

During FY 1991, watershed conditions were improved on 35,091 acres. The 1990 RPA Program goal is 46,000 acres annually by 1995. Appropriated funds improved 27,402 acres, excess timber sale receipts improved 1,386 acres, and Knutson-Vandenberg Act funds improved 5,635 acres (figure 43). An additional 668 acres were improved through human resource programs, volunteers, and cooperative partnerships.

An example of innovative watershed improvement work was accomplished by the Lake Tahoe Basin Management Unit (LTBMU) in California and Nevada. The LTBMU has developed a $250,000 per year challenge cost-share program in erosion control in the Lake Tahoe Basin through coordinated resource management planning and public and private partnerships. In addition to work on Federal lands, the LTBMU public assistance program for erosion control and water quality improvement has provided technical expertise and has successfully administered over $10 million in Federal grants to local governments. This program has resulted in the reduction of hundreds of tons of sediment and nutrients reaching Lake Tahoe.

*A riparian area at the headwaters of the Uinta River in the Painter Basin Research Natural Area, Ashley National Forest, Utah.*
Photo by Sherel Goodrich

### Riparian and Wetland Management

The Forest Service's National Strategy for Improving Riparian Areas was issued in FY 1991. It calls for using an integrated approach to implementing forest plan standards for riparian areas and wetlands; setting national, regional, and forest goals for on-the-ground riparian accomplishments; establishing regional action plans to improve basinwide riparian conditions; inventorying ecological health of riparian area conditions by 1995; and encouraging innovative solutions. Goals were established to improve unsatisfactory riparian conditions, avoid further degradation, provide assistance to private riparian landowners, increase research, and initiate riparian demonstration projects.

As a demonstration project, the Quinn River riparian project on the Humboldt National Forest was initiated in FY 1991 in cooperation with the U.S. Environmental Protection Agency (EPA) and the Nevada Department of Environmental Protection. A riparian pasture was fenced, and instream structures, bank stabilization, and willow plantings were done to improve the riparian area. Monitoring of channel cross-section, water chemistry, water temperature, and macro-invertebrates was initiated to measure future changes in the Quinn River riparian area.

*Forest Service soil chemist takes a reading from a Gallatin National Forest, Montana, stream during a study of trace metals in the Fisher Creek area.* Photo by Jill Bauermeister

### Soil and Water Quality Monitoring

The Forest Service is monitoring the effects of management practices and the effectiveness of soil and water conservation measures on watersheds to ensure that environmental standards for water quality and soil erosion are met. For example, in FY 1991 specialists from the Francis Marion-Sumter National Forests in South Carolina worked together on the Big Bend road reconstruction project. Sediment and safety problems as a result of high recreational and hunting traffic were occurring on the road. Specific road sections were identified as sediment sources and treated. The improvements reduced erosion, sedimentation, and safety hazards without affecting the experience of visitors.

On the Tongass National Forest, Chatham area, in Alaska, the proposed Kensington mine area is being monitored by the applicant, the State, and the U.S. Geological Survey agency. The data are helping design mine facilities, and will provide a solid baseline for the project environmental impact statement (EIS).

*Forest Service range conservationist on the Beaverhead National Forest, Montana, works with a local cattle rancher to install a water tank (guzzler).* Photo by Jill Bauermeister

The Southwestern Region has been involved in monitoring the effects of human activities on the habitat of several threatened or sensitive riparian plant species, including the Arizona willow, yellow paintbrush, and Mescalero thistle. The stream channel and water monitoring for the thistle were instrumental in a U.S. Fish and Wildlife Service finding of "no effect" on the thistle from a proposed harvesting activity.

### Water Rights Adjudications

In FY 1991, the Forest Service was involved in water rights adjudications by courts in Colorado, Idaho, Nevada, California, Montana, and other Western States. The Forest Service prepared claims for consumptive water uses and instream flows in five regions. Court decisions in these proceedings are not expected for some time.

*An air quality monitoring station, located between Yellowstone National Park and the Absaroka-Beartooth Wilderness Area, records meteorological and rainfall chemistry data.*
Photo by Jill Bauermeister

### Air Resource Management

In FY 1991, the air management program expanded the number of active visibility monitoring sites to 55 and augmented support to Environmental Protection Agency's IMPROVE (Interagency Monitoring of Protected Visual Environments) network of monitoring sites from two to nine. In addition, it continued lake and stream chemistry and biological studies in key sensitive areas.

In keeping with the 1990 RPA Program which projects a 47-percent increase in monitoring sites between 1990 and 1995, the number of sites in FY 1991 increased by 36 percent from FY 1990.

Automatic cameras are used to document air visibility over time in and near Class I airsheds.

The Forest Service co-sponsored a National Academy of Sciences study of the visibility monitoring programs of Federal land management agencies. Most of this work was finished in FY 1991; the final report will be published at a later date.

All regions completed development of a screening process for evaluating the air quality impacts of industrial permit applications on key resource values in Class I airsheds, as described in the 1990 RPA Program. Some 78 Prevention of Significant Deterioration (PSD) of air quality applications were reviewed by the Forest Service nationwide in FY 1991. This process is important in helping the Forest Service contribute to cleaner air, while at the same time providing for the Nation's energy security. The screening process highlighted important existing adverse conditions in two Class I areas in the Eastern United States. The Forest Service has continued to work with the EPA, the States, and involved companies to prevent further degradation and to mitigate existing loss of buffering capacity of lakes caused by deposition of air pollutants.

### Weather Program

The Weather Information Management System (WIMS) software development is nearly complete. FY 1991 field testing resulted in software improvements and enhancements. WIMS will eventually connect with the National Weather Service computer network of integrated weather data to provide 60 days of forestry and fire-related weather data collected by the Remote Automatic Weather Stations network.

## MINERALS AND GEOLOGY MANAGEMENT

### Minerals

Exploration, development, and production of energy and mineral resources from the National Forest System contribute to the growth and security of the Nation, provide locally significant employment (usually in rural communities), and raise revenues for the United States Treasury. The program is directed at maximizing these benefits while ensuring that development is conducted in an environmentally acceptable manner. Particular efforts are made to ensure that appropriate protection is given to other resource values and the environment, and to ensure that the land is restored to a productive condition. The five major components of the Minerals program, and selected FY 1991 accomplishments, are described below:

- Leasable minerals include oil and gas, coal, geothermal energy, phosphate, hardrock minerals (in acquired lands), and certain other commodities. During FY 1991, approximately 12 million acres were under lease for these minerals, mostly oil and gas. The Forest Service reviews leasing proposals, authorizes the Bureau of Land Management to issue leases, and then administers postlease surface use operations and reclamation.

*In the 1930's, miners often found their luck panning for gold on the Tongass National Forest in Alaska.* Photo by E.S. Shipp

The amount of land leased for oil and gas has declined from over 35 million acres in FY 1983 to less than 12 million in FY 1991, primarily due to economic conditions affecting the industry, but also as a result of a considerable amount of acreage having been made temporarily unavailable until environmental analyses are completed. The Forest Service completed 14 environmental impact statements addressing oil and gas leasing in FY 1991. As a result, an additional 1.5 million acres are again being made available for leasing. Bonus bids for the leases could exceed $20 million.

Another highlight of the leasable minerals program involved an increase in production from the largest surface coal mine in the world. The mine, located on the National Forest System in Wyoming, now produces approximately 3 percent of all coal mined in the United States.

*This hardrock quarry, in Minnesota, is a part of the Forest Service's rural development program.* Photo by P Finney

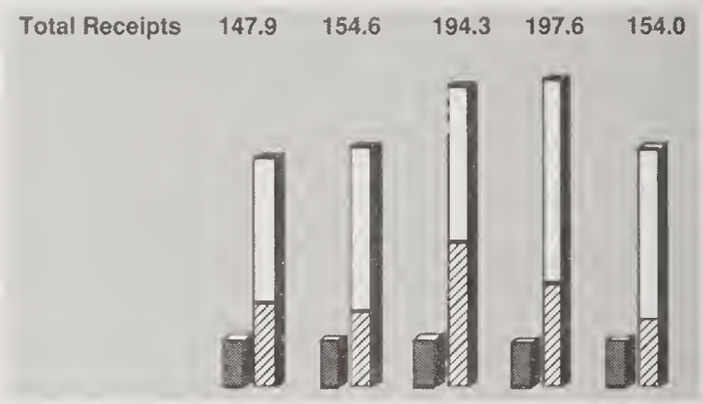
Also in FY 1991, the first geothermal power plant on the National Forest System was opened. The plant is located in California where over 100,000 acres of National Forest System lands are leased for geothermal energy. The potential for growth in the use of geothermal energy for electrical generation and for nonelectrical purposes is substantial on the National Forest System in California, Oregon, and Washington.

- Locatable minerals include gold, silver, copper, zinc, and other minerals made available under the Mining Law of 1872. The Forest Service regulates hardrock mineral operations to mitigate environmental effects and to ensure proper reclamation. Out of an estimated 7,000 active mine sites on the National Forest System, about 1,200 are producing minerals.

- Mineral materials include sand, gravel, stone, pumice, cinders, and other minerals considered to be fairly common in occurrence. These commodities are of considerable importance in supplying local construction, road building, and landscaping needs. The Forest Service manages over 1,000 pits and quarries and conducts sales (government entities are allowed free use), monitors operations, and specifies reclamation measures.

During FY 1991, the Forest Service published rules to resolve long-standing questions as to the types of mineral materials

Figure 44.
**Minerals—Funding and Receipts**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Million 1991 Dollars) | | | | |
| Funding | 31.5 | 30.1 | 30.7 | 29.1 | 30.4 |
| Receipts Collected Through U.S.D.I. | 93.4 | 105.7 | 100.3 | 131.0 | 110.0 |
| Receipts Reported by the F.S. | 54.5 | 48.9 | 94.0 | 66.6 | 44.0 |

*The first geothermal power plant on the National Forest System is located on the Inyo National Forest in California, and began operation in 1991.* Photo by Kate Higgins

*In 1934, a Forest Service pickup grades an Allegheny National Forest road with a road drag.* Photo by E.S. Shipp

eligible for sale to the public. Efforts were also begun to assist the economies of rural communities by emphasizing opportunities for production and use of building stone. These efforts will continue at both the local and national level.

### Geology Management

The geology component of the program provides support for a number of Forest Service activities including land and resource management planning, timber sale layout, mined land reclamation, watershed protection, recreation development, and road and other facilities construction. Geologic information is used in assessing mineral resources and in the evaluation, management, and protection of ground water and underground storage spaces on the National Forest System.

Funding and receipts for the minerals and geology management program are shown in figure 44. Accomplishments and mineral workload and production are displayed in tables 39 and 40.

## ENGINEERING

### Road Improvements

The Forest Development Road System provides access to the National Forest System. These roads are constructed, operated, and maintained to the minimum standard necessary to provide safe, economical, and environmentally acceptable access.

Recreationists are the primary users of forest development roads. Total recreation use in FY 1991 for such activities as hiking, hunting, skiing, camping, and driving for pleasure was 279 million visitor days. Driving for pleasure accounted for 96 million visitor days.

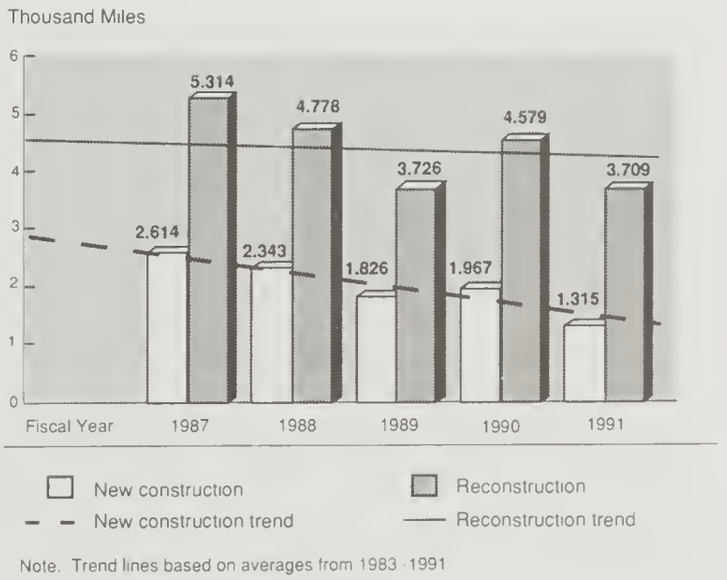
The 1990 RPA Program projects a decrease in new road construction and an increase in road reconstruction. As shown in figure 45, FY 1991 continued the downward trend in new road construction and a slight decrease in reconstruction miles. The decrease in reconstruction was caused by decreased timber harvests and budget constraints. During the same time period, the proportion of Forest Road Program (FRP) funds spent on recreation and general purpose roads increased from 4 percent to 43 percent. These trends are consistent with a road system that is largely in place, with an increasing emphasis on recreation and general purpose use.

During FY 1991, contracts were awarded for 1,311 miles of new road construction and 3,708 miles of reconstruction. Figure 46 provides a summary of planned versus accomplished miles. The decrease in Purchaser Credit Program mileage is consistent with the decrease in timber sale volume. Purchaser Election Program mileage was less than that planned because the small purchasers requested the Forest Service to construct fewer timber sale roads than initially anticipated. Forest Road Program mileage for new construction and reconstruction was within 2 percent of that planned.

Road construction and reconstruction by State for appropriated funds, purchaser credits, and purchaser election funds are shown in tables 41 and 42.

Existing roads have been reconstructed to accommodate increased traffic, improve public safety, improve access by reducing travel time, reduce user costs, and improve environmental protection. This work included surface and drainage improvements, road realignment to improve sight distance, addition of turnouts, and erosion protection.

Figure 45.
**Road Accomplishment Trends—Construction and Reconstruction**




Note. Trend lines based on averages from 1983-1991

Figure 46

**FOREST SERVICE ROADS PROGRAM**
**SUMMARY OF PLANNED VS. ACTUAL ACCOMPLISHMENTS FOR FY 1991**

| Funding Source [2] | Construction Miles [1] (New Roads) Planned | Construction Miles [1] (New Roads) Accomplished | Reconstruction Miles [1] (Improved Existing Roads) Planned | Reconstruction Miles [1] (Improved Existing Roads) Accomplished |
|---|---|---|---|---|
| PCP | 1,702 | 1,150 | 4,051 | 2,736 |
| PEP | 102 | 69 | 236 | 159 |
| FRP & TTSF | 94 | 96 | 829 | 814 |
| Total | 1,898 | 1,315 | 5,116 | 3,709 |

[1] Includes roads constructed or reconstructed using Tongass Timber Supply Fund, 4.2 miles of construction and 0.6 miles of reconstruction accomplished.

[2] Funds for forest road construction and reconstruction come from several sources. The Purchaser Credit Program (PCP) allows timber purchasers a credit against the price of the timber they buy equal to the cost of the roads they construct or reconstruct to harvest timber. The Purchaser Election Program (PEP) allows purchasers qualified as small businesses to have the Forest Service build the roads using funds from timber receipts. The Forest Road Program (FRP) finances the construction and reconstruction of recreation, general purpose,and some timber access roads from appropriated funds. The Tongass Timber Supply Fund (TTSF) finances the construction and reconstruction of timber access roads on the Tongass National Forest. In addition, FRP finances engineering, rights-of-way, and administrative support for all road construction and reconstruction done under PCP, PEP, and FRP. FRP finances the environmental studies and interdisciplinary,professional analysis (including archaeologists, biologists, landscape architects, and so forth) associated with road construction activities. FRP also finances the Forest Service share of cooperative road work with neighboring landowners or volunteers.

Although most new roads were initially built to access timber sales, these roads are used for recreation and other Forest Service resource activities such as firefighting, reforestation, and habitat improvement work.

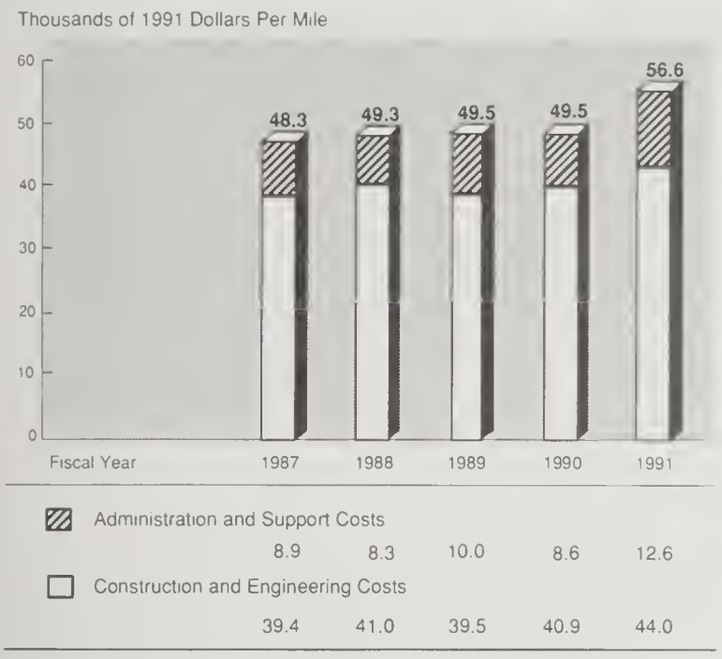
Based on the Road Analysis and Display System, unit costs for road construction, reconstruction, engineering, and administrative support increased in FY 1991. This increase in unit costs resulted from construction and reconstruction of fewer miles of timber access roads than initially planned (see figure 47).

In response to congressional concerns and in order to redirect road funds to support America's Great Outdoors, in FY 1991 the Forest Service conducted a strategic assessment of opportunities to transfer additional timber road costs to purchasers of National Forest System timber. Following are examples of specific strategies developed and being implemented, in cooperation with the forest products industry, to reduce dependence on timber program appropriated road funds. Each of these strategies is applicable in limited circumstances.

*Arterial roads make up 5 percent of the National Forest System's transportation system, and provides access to many resources.*
Photo by Randy Wilkerson

*Forest Service collector roads accommodate a variety of users and make up 20 percent of the transportation system.*
Photo by Randy Wilkerson

Figure 47.
**National Summary of Unit Costs for Road Construction and Reconstruction**




- Restrict the public's use of haul roads to reduce the need to reconstruct roads to accommodate mixed timber and public travel.
- Increase the use of Salvage Sale Fund collection/expenditure opportunities for road support costs.
- Delay road survey and design until after the timber sale is awarded, to avoid road support costs for timber sales that never sell due to legal and other unforeseen concerns.
- Require timber purchaser deposits for the costs of road reconstruction and engineering support.

### Road Operation and Maintenance

Over 95 percent of National Forest System activities depends on the Forest Development Road System. During FY 1991, the Forest Service expended $91.4 million in Federal appropriations to accomplish road and bridge maintenance. An additional $66.5 million were spent by timber purchasers to maintain roads used to haul timber. Other commercial users spent $8.3 million.

During FY 1991, 25 percent of the road system was intended for use by passenger cars; 57 percent was intended for use by high-clearance vehicles (such as pickup trucks, four wheel-drive vehicles, and logging trucks); and 18 percent of the roads was closed to motorized traffic yearlong. Seasonal restrictions are imposed on road use protect wildlife, prevent forest fires, prevent road damage when the road is unstable, and provide for the public's safety.

With the funds provided in FY 1991, 45 percent of the road system was maintained to the standard necessary to protect investments, to protect the environment, and to support existing traffic demands. The remaining 55 percent was maintained to a lower standard.

To help control costs and improve program flexibility, forests continued to contract for road maintenance. The forests also continue to work with State, county, and local agencies to reduce costs for all parties. Road maintenance costs by State are shown in table 43.

In FY 1991, 3,400 miles of road that were no longer needed to implement forest plans were obliterated and the land restored for production of vegetation. The obliteration work was accomplished with road maintenance funds made possible through special language in the FY 1991 appropriation. This work was often a key element in restoring riparian areas, improving water quality, and improving wildlife habitat.

*Local roads make up 75 percent of the transportation system.* Photo by Randy Wilkerson

*Timber bridges are an essential part of the transportation system. This bridge is located on the Monongahela National Forest in West Virginia.* F S Photo

### Bridges

The Forest Service has over 8,000 road bridges on the Forest Development Road System.

In FY 1991, 23 new bridges were constructed, and 126 bridges were reconstructed or rehabilitated. This included 52 bridges having timber as the primary structural component. This continues the agency's commitment to the Timber Bridge initiative. Bridge construction and reconstruction, by State, with appropriated dollars and with purchaser credit, are shown in table 41.

The bridge program includes regular inspection, load capacity rating, and posting of restricted bridges. For bridges on forest development roads maintained for passenger car use, implementation procedures are underway to report inventory data to the States for inclusion in the National Bridge Inventory. These data will enable the Forest Service to closely monitor the condition of all bridges and to report trends.

### Buildings

The Forest Service owns or leases buildings providing approximately 26 million square feet of space located on 852 administrative units. Twenty-two percent of the buildings is leased.

The appropriation for construction of fire, administrative, and other facilities for FY 1991 was $14 million; the appropriation for construction of research facilities was $18.4 million. At the current level of funding, the FY 1989 backlog of $448 million in needed facilities will continue to grow. In addition to appropriated funds, forests used their minor construction authority to spend other appropriated dollars to renovate and construct buildings.

Maintenance costs for fire, administrative, and other facilities continued to increase as the age of the buildings increased and standards changed. In FY 1991, $24.9 million in appropriated funds and $6.5 million in rent receipts were spent to maintain buildings.

*Barrier-free access to Forest Service buildings is essential for serving the public and employing a diverse work force.* Photo by David Pratt

A major part of the maintenance program in FY 1991 was the identification and removal of asbestos, and the reduction of radon levels to meet health and safety standards. Efforts continued to ensure building accessibility for all people, and to provide equal facilities for both genders. The emphasis on accessibility and equal facilities contributes to recruiting and retaining a diverse work force and in serving our publics.

To help stretch construction and maintenance funds, Job Corps personnel, prison crews, and volunteers are used to maintain and construct buildings.

### Federal Facilities Compliance Program

The Federal Facilities Compliance (FFC) Program brings Federal buildings and sites into compliance with several laws enacted to protect the public health and the environment. The Forest Service has identified 2,986 projects to bring its buildings and sites up to standard.

In FY 1991, the Forest Service completed 355 of these FFC projects. Types of projects completed were cleanup of hazardous waste, mine, and sanitary landfill sites; removal, disposal, and cleanup of underground storage tanks; mitigation of asbestos and radon in buildings; and the upgrade of drinking water systems.

### Equipment Management

The Forest Service maintained approximately 16,000 vehicles and 2,000 pieces of specialized equipment.

In FY 1991, the Forest Service worked closely with the General Services Administration to pilot-test an electronic system to procure vehicles. Two thousand vehicles were ordered using the system, which will be expanded to include other USDA agencies. It is estimated that the electronic process will shorten by 2 months the procurement time for each vehicle.

### Engineering Support

The Technology and Development Centers at Missoula, Montana (MTDC), and San Dimas, California (SDTDC), implement promising new technologies in partnership with the National Forest System, State and Private Forestry, Administration, and Research branches; other Government agencies; and private industry. New technologies that improve efficiency, reduce costs, and make significant contributions to resource management are transferred to Government and private land managers. The following are selected examples of technologies explored and tested in FY 1991.

**Commercial Central Tire Inflation (CTI) System Contracts Awarded.** Two contracts were awarded for the manufacture and installation of 29 CTI systems on commercial log trucks and Forest Service dump trucks, beginning in September 1991. Canada, Australia, New Zealand, and Norway are also involved in evaluating CTI systems as a means of reducing road reconstruction and maintenance costs in forested areas.

*Foam firefighting equipment has proven to be a valuable tool.* Photo by Dan McKenzie

**Portable Crossings for Wetland Areas and Streams**. Many temporary Forest Service roads built for timber harvesting pass through wetland areas or over streams. To help harvest this timber in an environmentally sound manner, a report on available portable stream crossings has been prepared and will be distributed in FY 1992.

**Foam Technology**. Foam firefighting equipment technology developed at SDTDC extends the fire suppression ability of a given quantity of water three to fives times. This new approach saves time, money, lives, and personnel resources. It has been incorporated into the day-to-day firefighting methods of the Forest Service and several agencies of the Department of the Interior, plus numerous States, counties, cities, and foreign countries.

**Laser Tree Measurement Device**. Measuring the height and diameter of standing trees has always been a difficult and labor-intensive job for timber cruisers. MTDC personnel participated with the Northern Region and forest products industry to develop a laser tree measurement device. Seventeen hand-held laser units are now being evaluated Servicewide; commercial production of the device is planned for early 1992.

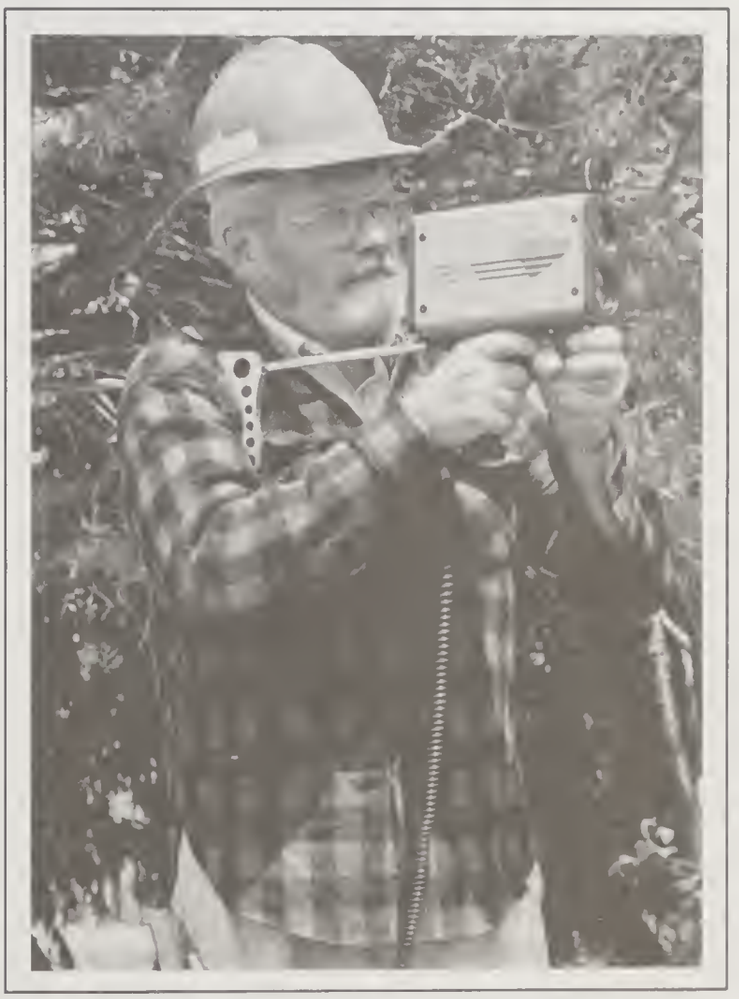
*Acquiring digital data is an essential part of a Geographical Information System (GIS).* F S Photo

### Mapping and Digital Spatial Data

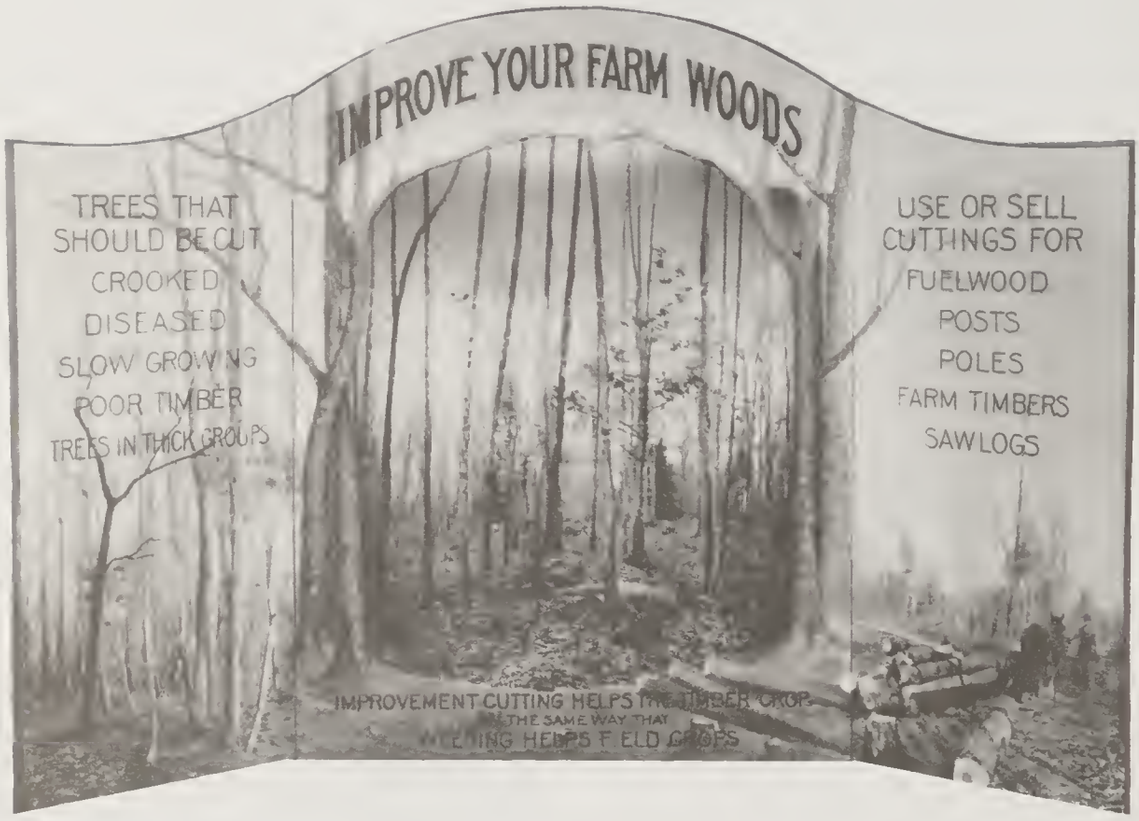
In FY 1991, the Geometronics Service Center updated 742 Primary Base Series maps (1:24,000 scale) and 47 Secondary Base Series maps (1:126,720 scale). The Center completed 1,300 cartographic feature files containing digitized information from base series maps. This information will be used to speed up future revisions and to provide a base for geographic information systems. The Center completed 1,900 digital elevation models and generated 2,021 orthophotos for forest planning and resource management use.

### Remote Sensing

The Integration of Remote Sensing Into Resource Data Collection for GIS (Geographic Information System) Program, initiated in FY 1990, continued with the development of tools for gathering resource information and entering it into GIS databases at the forest level. Digital data from satellites, along with ground checking, can detect changes in land cover resulting from various management practices or from natural occurrences. This information can be used to monitor forest plan implementation. Satellite data and airborne video have been used to inventory and analyze old-growth forests.



*Measuring tree height and diameter goes high-tech with the laser measuring device.* F.S Photo




*The Clarke-McNary Act of 1924 authorized the Secretary of Agriculture to provide forestry assistance to State and private lands. This 1930 exhibit promotes good form forestry.* F.S. Photo

## Chapter 3

# State and Private Forestry

*Beyond the Boundaries—Outreach to America*

Photo by Bob Conrad

## INTRODUCTION

Consistent with the Forest Service's mission and its RPA Strategic Plan, the State and Private Forestry programs offer technical and financial forestry assistance to State and private forest landowners. This aids in the protection and management of the more than 600 million acres of forested land in the United States outside the boundaries of the National Forest System. The programs serve as a link between many public and private organizations, and bridge ownership and organizational boundaries to promote the best use of America's natural resources. Toward these ends, State and Private Forestry efforts are guided by the 1990 RPA Program. In November 1991, the Forest Service met with State Foresters, various American Indian Tribes, and other key State and private cooperators to plan the implementation of the 1990 RPA Program. Five emphasis areas for State and Private Forestry were identified: multiresource management and stewardship, forest health and protection, rural America, urban and community forestry, and natural resource conservation education.

## COOPERATIVE FORESTRY

### Forest Management and Utilization

The Food, Agriculture, Conservation, and Trade Act (1990 farm bill) includes significant responsibilities in forestry for the Forest Service within the State and Private Forestry Title (Title 12) and Rural Development Title (Title 23). The Cooperative Forestry Assistance Act of 1978 was amended by the 1990 farm bill (Title 12).

Table 44 compares State and Private Forestry FY 1991 appropriations with long-term projected costs from the 1990 RPA Program, and table 45 displays FY 1991 appropriations along with FY 1987-1990 appropriations. Table 46 compares FY 1991 accomplishments with long-term projections of accomplishments from the 1990 RPA Program.

*Children in a Washington, DC, neighborhood follow President Bush's request that every American plant four trees in 1991.*
Photo by Karl Perry

### America the Beautiful Act of 1990

The Forestry Title of the 1990 farm bill contains a nationwide, multiyear program of tree planting and forest improvement. It is the America the Beautiful Act of 1990. The act is to be implemented through the Forest Stewardship, Stewardship Incentive, and Urban and Community Forestry Assistance Programs of the same Title. The goal is planting, improving, and maintaining trees in communities and rural areas across the Nation. These programs have stressed environmental education to improve public awareness and understanding of the benefits and needs of trees and forest cover in rural and urban areas.

### Forest Stewardship Program and Stewardship Incentive Program

The Forest Stewardship Program provides for assistance to landowners to encourage the long-term stewardship of

*A rural home landowner admires her freshly planted tree, inspired by the Forest Stewardship Program of the 1990 farm bill.*
Photo by Yuen-Gi Yee

nonindustrial private forest lands. The goal is to prepare management plans for at least 25 million acres of land by December 31, 1995, by assisting landowners in preparing a forest stewardship plan that describes multiresource actions to be taken by the landowner and that is compatible with landowner objectives. This is the rural trees element of the America the Beautiful program.

The Stewardship Incentive Program is the cost-share mechanism to assist landowners in implementing their stewardship plans to meet the goals and objectives of forest stewardship.

These programs build upon the existing delivery system and programs for rural tree planting and forest improvement in the Department of Agriculture. The Conservation Title of the 1990 farm bill includes incentives to plant hardwood trees under the Conservation Reserve Program.

Accomplishments in FY 1991 include:

- Establishing national standards and guidelines to implement the Forest Stewardship Program.
- Assistance in developing 12,019 stewardship plans for 1,573,444 acres added to the program nationwide (see table 47). This brings the total plans to 20,714 and the total acres to 2,412,847.
- Forming State Forest Stewardship Coordinating Committees in all 50 States, the District of Columbia, Puerto Rico, and the South Pacific islands.
- Drafting and publishing Interim Stewardship Incentive Program regulations in the Federal Register.

### Urban and Community Forestry

As directed in Section 1219 of the 1990 farm bill, the Urban and Community Forestry Program promotes and improves the economic, environmental, and social well-being of communities through the planting and management of trees, shrubs, and other vegetation. These efforts enhance the city environment, make important contributions to soil, water, and air quality, and help conserve energy and reduce atmospheric carbon dioxide.

In FY 1991, funds were allocated to field units or used on projects having a national scope. Joint State, local, and Federal cooperation resulted in the following program accomplishments:

- Technical and financial assistance for tree planting and maintenance provided through State Foresters to 11,607 communties.
- Urban forestry coordinators established in all 50 States, the District of Columbia, Puerto Rico, and the South Pacific islands.
- Urban forestry advisory councils, requested in the national urban forestry implementation plan, are now in place.
- The National Grove of State Trees project moved from concept to reality in June 1991. The first 10 States sent their trees to be planted and on June 20, a celebration ceremony was conducted.
- A research-needs assessment completed, in cooperation with the International Society of Arboriculture (ISA) and Forest Service Research, to provide guidance for the National Urban Forestry Council in preparation of a 10-year action plan.
- An urban forestry curriculum project was established at Southern University in Louisiana, one of the 1890 Land Grant Colleges and Universities. A National Volunteer Training project was also established, in conjunction with the American Forestry Association, to assist volunteer leaders motivate and organize citizen tree action groups and to provide technical advice in tree care and planting.
- A national project developed to improve urban forest inventory processes and to identify benefit-cost ratios for trees in cities and communities for use in justifying municipal expenditures for tree programs.
- A National Integrated Pest Management project established with the International Society of Arboriculture (ISA) and the National Arborists Association, to promote use of all possible management methods and reduce dependence on pesticide use on urban trees.
- Local tree planting activities across the Nation generated extensive local television coverage, signifying a great interest in the America the Beautiful initiative.

*Students at the Van Ness Elementary School in Washingotn, DC, plant a tree to commemorate Arbor Day.* Photo by Karl Perry

*Travertine stone mined from the Gallatin National Forest near Gardner, Montana, has become a steady source of income for this small mill owner who employs community people to cut, polish, and ship the stone products.* Photo by Jill Bauermeister

### Rural Development Initiative (Rural America)

In FY 1991, the Forest Service helped implement the President's initiative on rural development by assisting in the formation of eight pilot State Rural Development Councils to better coordinate Federal and State rural development programs. The agency also kicked off implementation of its own strategy, "Working with Rural America," a key goal of which is to actively participate in planning and implementing community-based rural development activities. State and Private Forestry (S&PF) has the overall Forest Service leadership responsibility, including coordination within the agency, with other State and Federal agencies, and with the Department of Agriculture.

The Rural Development Title of the 1990 farm bill gave the Forest Service responsibility to work with National Forest System-dependent rural communities under the Rural Revitalization through Forestry subtitle. The subtitle calls for the Department of Agriculture to provide educational programs and technical assistance, and to help communities organize action teams, develop local action plans, and implement the plans through cost-sharing and other means.

Key FY 1991 accomplishments include:

- Holding a national rural development workshop in March 1991 to build an understanding about program goals.
- Organizing a national effort to evaluate, through case studies, opportunities for diversifying rural resource-dependent communities through fisheries, wildlife, and related outdoor recreation.
- Administering a number of programs that focus on strengthening rural communities through economic diversification, and making better use of forest resources.
- Financially supporting a Rural Economic Development Institute at the University of Wisconsin.
- Developing guidelines for implementing Rural Revitalization through Forestry section of the 1990 farm bill (Title 23, Subtitle G).
- Serving on a departmental task force to develop the framework for the new Rural Development Administration (RDA), as called for in the 1990 farm bill.
- Developing and distributing the Forest Service Strategic Plan for working with rural America (15,000 copies).
- Working with the the National Association of State Foresters on the formation of an ad hoc committee on rural development.

### Wood Utilization

Utilization and Marketing (U&M) activities have traditionally been aimed at conserving the forest resource through improved harvesting and processing efficiency and technology transfer. A comprehensive evaluation of this program took place during FY 1991. A national strategy was developed for a refocused program to be renamed "Forest Products Conservation and Recycling." The strategy focus is on providing leadership in finding forest-resource solutions to national priority issues; e.g., economic development, conservation of the environment, and recycling.

Key FY 1991 accomplishments include:

- Rewriting the Integrated Mill Production and Recovery Options for Value and Efficiency (IMPROVE) System.
- Providing financial support to recognize and catalog a variety of nontraditional "Special Forest Products." This will enable the Forest Service to provide enhanced opportunities for wise and innovative use of forest resources to improve local economies. Revision of the USDA Agricultural Bulletin No. 278, "Special Forest Products for Profit," is in progress.
- The Forest Service energy program was developed as a comprehensive approach to meeting biomass energy objectives of the President's National Energy Strategy.

### Timber Bridge Initiative

In FY 1991, Congress appropriated $2.7 million to continue the Timber Bridge initiative. The Forest Service cost-shared for construction of an additional 49 modern timber bridges and seven timber bridge conferences in FY 1991. Since the beginning of the initiative in FY 1989, 178 wooden bridges in 45 States and the District of Columbia have been approved for construction, and 28 national conferences and workshops have been conducted. This year, 55 bridges were constructed to improve the transportation network on public lands. The research component of the initiative focused on performance testing of timber bridge construction to ensure safety standards are met. The Timber Bridge initiative's effect in strengthening rural economies continues to be emphasized. Using wood creates local jobs and improves the long-term employment prospects through additional service industries.

### Statewide Forest Resource Planning

The Statewide Forest Resource Planning Program received $853,000 in FY 1991 which, combined with State funds, helped 50 States, Commonwealths, and Territories and the District of Columbia update their strategic plans. These funds also helped sponsor a strategic planning workshop for the Western State Forest Resource Planners Association, during which a report was drafted on the major natural resource issues facing the 17 Western States.

### Forest Resource Management Program

Fifty-seven percent of the Nation's timberland is owned by nonindustrial private forest landowners. The Forest Resource Management program cooperates with State forestry agencies to provide technical assistance to these landowners for managing their forest lands (tables 48-52). During FY 1991, by providing assistance through multiresource management plans, this program helped landowners manage 4.1 million acres.

In FY 1991, the Forest Resource Management Program helped plant trees on 800,000 acres. The program accomplished timber stand improvement on 256,610 acres. The program also provided professional support to leaders and members of the Congressional Forestry 2000 Task Force.

### Soil and Water

Through the Forest Resource Management Program, the Forest Service provides technical assistance to State Foresters in soil and water resources. Current emphasis is on nonpoint source pollution control, forested wetland management, and protection of soil productivity. State Foresters in 18 States have taken the lead in monitoring landowner compliance with nonpoint source pollution control practices.

During FY 1991, the Forest Service developed a standardized monitoring procedure that will be used to expand the program to other States. In Montana, the Forest Service is assisting the State Forester and other cooperators in the development of a sediment yield model to help protect water quality on a mixed ownership watershed. Assistance was provided to 29 State Foresters in designing and conducting logger and landowner training programs for pollution control to increase their knowledge of the overall situation and to demonstrate acceptable pollution control practices.

### Forest Taxation Information

The Forest Service provides taxation information to private forest landowners to assist them in planning for their financial future. Two taxation workshops were presented in the Pacific Northwest to assist timber-dependent communities. A national timber tax information meeting was also held to bring together general concerns of the private forest landowner community.

### Emergency Reforestation for South Carolina (Hurricane Hugo)

In FY 1991, $2,984,000 was allocated to South Carolina to assist reforestation efforts to repair the damage caused by Hurricane Hugo. Approximately 7,048 acres have been prescribed for reforestation, 1,151 landowners have received assistance, and 712 management plans were prepared.

*Seedlings are planted in an early tree nursery.* F S Photo

### Seedlings, Nurseries, and Tree Improvement

This cooperative Federal-State program provides high-quality, genetically improved tree seed and planting stock for reforestation to protect soil and water resources and improve land productivity. The program provides technical expertise to increase seedling survival, shorten forest rotation lengths, augment species resistance to disease and insects, and improve tree form and wood quality.

*Emergency relief efforts included planting seedlings throughout the forests in South Carolina following Hurricane Hugo.* Photo by Bob Nichols

*Forest Service personnel provide technical assistance in the proper care of young conifer seedlings.* Photo by Jim Hughes

In FY 1991, an estimated 1.7 billion tree seedlings were produced and planted on about 2.5 million acres nationwide. Approximately 50 percent of these seedlings were planted on 1.1 million acres of State, local government, and nonindustrial private lands. Various Department of Agriculture incentive programs—Conservation Reserve Program, Forestry Incentives Program, and Agricultural Conservation Program—contributed to these tree planting efforts. Under the Conservation Reserve Program, 167,468 acres were enrolled for tree planting in FY 1991.

### Forestry Incentives

The Forestry Incentives Program and the forestry component of the Agricultural Conservation Program are important cost-share programs promoting forestry on nonindustrial private forest lands. Both programs are administered by the Agricultural Stabilization and Conservation Service (ASCS), with technical responsibility for forestry activities assigned to the Forest Service and State Foresters. Together, these programs account for approximately 25 percent of all reforestation on nonindustrial private forest lands. In FY 1991, reforestation under the two programs totaled 150,000 acres and 110,000 acres, respectively. Timber stand improvement activities for the Forestry Incentives Program totaled 31,000 acres, and for the Agricultural Conservation Program totaled 38,000 acres.

## COOPERATIVE WATERSHED ACTIVITIES

The Forest Service cooperates with the USDA Soil Conservation Service in several programs authorized by the Watershed Protection and Flood Prevention Act. In FY 1991, the Forest Service provided expertise and information in 51 river basin studies and 30 watershed planning projects to help find solutions to local problems. For example, the Forest Service arranged a streambank demonstration project as part of the Kuskokwin River Basin Study in Alaska. Local students used soil bioengineering techniques to stabilize a streambank in the Alaskan Native village of Upper Kalstag.

The Forest Service arranged for State forestry organizations to provide technical assistance to landowners on 20 small watershed projects. Technical assistance was also provided to 1,990 landowners for the installation of land treatment measures on 28,440 acres.

In addition, the Forest Service participated in five flood prevention projects. In cooperation with State forestry organizations, technical assistance was provided to 1,920 landowners, and watershed conditions were improved on 11,700 acres of forest and rangeland.

Under the Emergency Watershed Protection Program (Public Law 95-334), the Forest Service and the Soil Conservation Service (SCS) provided technical and financial assistance on both public and private lands. In FY 1991, work was completed on repairing the damages from Hurricane Hugo in Puerto Rico. The work focused mainly on stabilizing landslides that threatened roads and public water supplies. Approximately 50 of the 400 landslides

*Structures were used to stabilize landslides following Hurricane Hugo on the Caribbean National Forest, Puerto Rico.* Photo by Luis Rivera

*Western pine beetle epidemic, Blue Canyon area, Sierra National Forest, in 1931.* F.S. Photo

caused by the storm were treated and 11 different water supplies were restored.

### Resource Conservation and Development (RC&D)

The Forest Service, in cooperation with the State forestry organizations, participates in the Resource Conservation and Development Program. Funds for implementing RC&D forestry measures and technical assistance are transferred to the Forest Service from the Soil Conservation Service based on recommendations of individual State conservationists. State forestry organizations match at least 20 percent of these funds; however, in FY 1991, the average State matching was closer to 40 percent. Approximately $4 million in Forest Service and State forestry funds have benefited RC&D areas in the form of rural development grants, economic diversity studies, timber bridge demonstrations, State forestry and Forest Service personnel, and other contributions.

## FOREST PEST MANAGEMENT

All Forest Pest Management (FPM) activities are under the leadership of the State and Private Forestry branch.

The Forest Service provides protection services from insects and diseases on both Federal and non-Federal lands. The direct value of timber saved by pest management prevention and suppression project activities on all lands in FY 1991 is estimated at $61 million. Pest management projects also helped protect recreation areas, wildlife habitats, and watersheds. National total program expenditures were $66 million—$45 million in Federal funds and $21 million in State funds. Federal funds supported all program and suppression activities on Federal lands, plus 28 percent of program activities and 45 percent of suppression activities on State and private lands. State funds supported the balance of cooperative program activities, while State, county, private, and other funds supported the suppression activities.

### Surveys and Technical Assistance

The Forest Service provided technical and funding assistance to State forestry organizations in detecting and evaluating vegetation damage or pest populations on 515 million acres of State and private lands. The Forest Service also surveyed 45 million acres of Federal lands other than National Forest System lands, and provided findings, recommendations, and advice about suppression needs and available alternatives to the managers of those lands where risks were identified.

The Forest Service is implementing a nationwide forest health monitoring system to detect and report unusual changes in forest conditions, to determine the cause, and to predict the consequences sufficiently to develop management actions to protect the Nation's resources. In FY 1991, test plots established in New England in FY 1990 were remeasured. New plots were established and initially measured in New Jersey, Delaware, Maryland, Virginia, Georgia, and Alabama. Early measurements establish the baseline from which improved or deteriorating health is measured.

The Forest Service completed an extensive assessment of the risk of introducing exotic forest pests into North America through the importation of unprocessed logs from Siberia and the Russian Far East. The assessment concluded that such importation could have serious economic and ecological consequences, and that mitigation measures would have to be implemented.

### Pest Outbreak Prevention and Suppression

Pest suppression projects protected an estimated 705 million cubic feet of merchantable timber among all ownerships. In addition, an estimated 27 million cubic feet of insect-infested timber were salvaged.

The gypsy moth, *Lymantria dispar*, continues to infest trees in currently infested areas and expand into new areas. The Forest

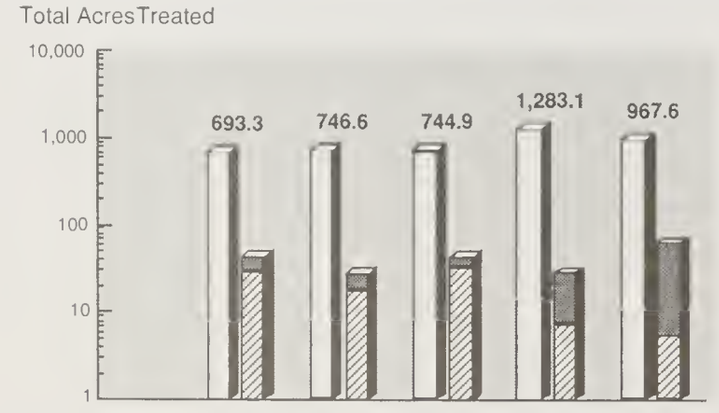
Service helped State agencies with projects on 905,100 acres of State and private lands in Delaware, Maine, Maryland, Michigan, New Jersey, Ohio, Pennsylvania, Virginia, and West Virginia. Overall, the total treated area was 905,100 acres, 348,600 acres less than acreage treated in FY 1990. However, Ohio was added to the list of States with infested counties.

On Federal lands (other than the National Forest System), 36 suppression projects were conducted on 57,100 acres of land in Maryland, Michigan, New York, Pennsylvania, Virginia, and Washington, DC—an increase of 35,400 acres over the 21,700 acres treated in FY 1990.

The total treated acres for gypsy moth suppression on lands of all ownerships are shown in figure 48.

The Forest Service conducts or participates in eradication projects to prevent the gypsy moth from becoming established in new areas. In FY 1991, treatment areas were in North Carolina (7,300 acres) ; Utah (29,900 acres—includes 12,200 acres of State and private and 17,700 acres of national forest lands); and Wisconsin (5,900 acres—the first year for Wisconsin). The North Carolina infestation was treated with one application of the bacterial insecticide *Bacillus thuringiensis*. The Utah infestation was treated with three applications, and the Wisconsin infestation was treated with two applications.

Figure 48.
**Gypsy Moth Suppression on Lands of All Ownerships [1]**




| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Thousand Acres) | | | | |
| State and Private Lands | 648.9 | 719.3 | 701.6 | 1,253.7 | 905.1 |
| Other Federal Lands | 14.7 | 9.4 | 10.8 | 21.7 | 57.1 |
| National Forest System Lands | 29.7 | 17.9 | 32.5 | 7.7 | 5.4 |

[1] Excludes eradication and Appalachian Gypsy Moth Integrated Pest Management Demonstration Projects.

The Forest Service assisted State managers in suppression of the southern pine beetle, *Dendroctonus frontalis*, on 10,900 acres of State and private lands, and assisted other Federal managers on 89,100 acres of non-Forest Service Federal lands. Suppression activities included salvaging infested areas, cut-and-leave harvesting, and piling and burning infested logging slash. Suppression activities protected about 19.7 million cubic feet and salvaged an additional 14.3 million cubic feet of pine timber.

Mountain pine beetle, *Dendroctonus ponderosac*, suppression occurred on 500 acres of State and private lands, and 1,000 acres of non-Forest Service Federal lands. Approximately 5.2 million cubic feet of timber were protected, and an additional 0.3 million cubic feet of timber were salvaged.

Douglas-fir tussock moth suppression was required on 2,100 acres of State and private lands which were intermingled with and adjacent to a larger infestation on National Forest System lands. About 4.7 million cubic feet of merchantable timber were protected. The project also protected recreation, watershed, and wildlife values by preventing further defoliation, treetop killing, and tree mortality. No suppression was required on other Federal lands.

### Pest Management Special Projects

The Appalachian Gypsy Moth Integrated Pest Management Demonstration Project is a multiyear, multiagency project which will evaluate options in slowing the spread of the gypsy moth and in reducing its negative impacts.

The FY 1991 treatments, using the mating disruption technique with pheromone (gypsy moth sex attractant) impregnated plastic beads and flakes, were extremely effective in preventing successful mating and subsequent population buildups. The use of substerile male pupae against low-level populations proved effective in preventing population buildup. This latter technique needs further work to improve application methods and reduce costs.

*A gypsy moth caterpillar on the George Washington National Forest in Virginia.* Photo by Yuen-Gi Yee

Early indications of FY 1991 trials of reduced dose rates for Dimilin and *Bacillus thuringiensis* tend to confirm the FY 1990 trials, which suggested that reduced dosages are effective. GYPCHEK trials indicate that the virus is ready for operational use. The problem now is the short supply of GYPCHEK.

The Forest Service continued its participation in the National Agricultural Pesticide Impact Assessment Program. In FY 1991, 21 projects were conducted to improve our knowledge of the risks and benefits of using pesticides in forestry. Studies concentrated mostly on the fate of pesticides in the environment.

### Pest Management International Assistance

For information on Forest Service pest management assistance to other nations, see International Forestry, Chapter 4.

## SPECIAL PROJECTS

### Lake Tahoe Erosion Control Program (Burton-Santini Act)

During FY 1991, the Secretary of Agriculture granted $1,385,000 for five new soil erosion and water pollution control projects in the Lake Tahoe Basin. These Federal funds were matched by $1.2 million in State and local funding. Eleven projects were completed in FY 1991, with an estimated net sediment reduction of 50,000 tons.

The Forest Service is coordinating the efforts of the Lake Tahoe Erosion Control Technical Advisory Committee, which consists of all funding, regulatory, and implementing agencies involved in the Lake Tahoe Erosion Control Program. In FY 1991, the group's major focus was to develop uniform guidelines for design, review, and monitoring.

### Economic Diversification Studies

In FY 1991, Congress appropriated $497,000 for economic diversification grant programs to help rural communities dependent on forest resources or threatened by reductions in raw materials from the National Forest System or other ownerships. Fourteen projects were cost-shared with local and State governments in 11 States: Alaska, Arizona, California, Idaho, Maine, Montana, North Carolina, Oregon, Utah, Washington, and Wyoming. Examples include:

- Harney County, Oregon. An economic strategy was developed including identification of specific projects to enhance the

*Retaining walls, rock, and revegetation were used to stabilize slopes in the Rubicon Project Area, Lake Tahoe Erosion Control Program.*
Photo by Susan Norman

employment base and training to develop community leadership skills.

- Graham County, North Carolina. An economic study was developed to find solutions to declining economic conditions, to initiate short-term action to save and create jobs, and to initiate actions to increase or supplement income.

- Greenville, Maine. A study was made to assess previous economic studies on forest resources and tourism, to develop a marketing and business plan, and to implement an action plan.

### Mercer County Hardwood Machinery Training Center

In FY 1991, Congress provided funds to establish a hardwood machinery training and flexible manufacturing facility. This facility, a public nonprofit entity, provides economic development opportunities, and creates incentives for developing high-quality products from hardwood forests. In FY 1991, the focus was on developing the training center. In cooperation with the Mercer County Development Authority, a steering committee was formed and plans for the facility's construction were begun.

### The Sterling Forest

In FY 1991, Congress provided $249,000 to study and recommend alternative conservation strategies for the best management of forest resources in the New York/New Jersey Highlands Region, which includes the 20,000-acre tract called the Sterling Forest. This study focused on options and alternatives to high-intensity development, including options to protect the region's landscape while providing economic benefits to local communities. A report will be submitted to Congress in the spring of 1992.

### Northern Forest Lands Study

In FY 1988, Congress directed the Forest Service to study the effects of ownership and management changes of large tracts of forested lands in northern New England and New York. The Governors of Maine, New Hampshire, Vermont, and New York set up a task force to work with the Forest Service on the study. A final report, released in May 1990, identified and assessed the forest resources, landownership patterns, social and economic changes, and strategies necessary to meet study objectives.

In FY 1991, Congress provided funds to the Forest Service to maintain a representative, establish a Northern Forest Lands Council and Executive Director, hire resource planning specialists in each of the four States, and analyze and conduct an inventory of resource information necessary to carry out objectives planned by the Council.

### The Pinchot Institute for Conservation Studies

The Pinchot Institute for Conservation Studies in Milford, Pennsylvania, is the former family home of Gifford Pinchot, first Chief of the Forest Service. The home, with 102 acres of forests, meadows, and formal gardens, was deeded to the Forest Service in 1963, and dedicated by President John F. Kennedy "for a greater knowledge of the land and its uses." A center for discussing natural resource issues of national and regional importance, the Pinchot Institute seeks solutions in the earliest stages of issues.

In FY 1991, the Institute began providing a forum for the promotion and discussion of natural resource conservation. Interpretive tours and conservation education programs were provided to numerous visitors and school groups. During FY 1991, approximately 20,000 people visited the site.

### Natural Resource Conservation Education Program

The Natural Resource Conservation Education Program was launched in June 1991, based on the recommendations of a national task force, comprised of representatives of the Forest Service and the National Association of State Foresters (NASF), with assistance from numerous groups of educators. The Natural Resource Conservation Education Program is a national program with goals and funding incentives to ensure a cooperative delivery of structured education to targeted audiences. In FY 1991, it disbursed $100,000 to further Forest Service and State forestry education partnerships for outstanding conservation education programs and projects.

Introducing the Natural Resource Conservation Education Program to the Forest Service as well as to other Federal and State agencies, such as the Environmental Protection Agency, Extension Service, and Soil Conservation Service, was accomplished through a series of orientation meetings. Outreach to the educational community was achieved through networking with existing educational entities such as the Alliance for Environmental Educators and the North American Association of Environmental Educators. The Forest Service, through this program, has provided expertise in the natural resources by serving on the EPA's pollution task force.

A participating agreement with the Boy Scouts of America, through the T.R.A.I.L. Boss (Teaching Resource And Individual Leadership) interagency steering committee, tied in seven other Federal agencies to promote environmental education. Those agencies include the Soil Conservation Service, Environmental Protection Agency, National Park Service, Fish and Wildlife Service, Army Corps of Engineers, and Bureau of Land Management.

In FY 1991, memoranda of understanding were established with the Soil Conservation Service, the National Council of Catholic Women, and the Girl Scouts in order to increase local interest in the conservation of our natural resources.

## TROPICAL FORESTRY

In FY 1991, Congress appropriated $2.487 million to improve forest management and conservation in tropical countries through training and technical assistance, and through support to international organizations. The initiative contributed to 84 projects or activities worldwide, involving the Forest Service, State agencies, universities, development agencies, and private organizations. The Forest Service trained more than 500 forestry specialists in

25 developing countries and cooperated with more than 108 organizations, such as the World Wildlife Fund and the Nature Conservancy.

The Forest Service participated in projects such as the global assessment of the world's tropical forests in conjunction with the United Nations Food and Agriculture Organization (FAO). The Latin American and Caribbean regions, working in cooperation with Forest Service facilities in Puerto Rico, received special attention. Many projects were also developed in the South Pacific, in conjunction with Forest Service specialists in Hawaii.

Highlights of accomplishments for FY 1991 include:

- Holding two remote sensing training sessions in conjunction with FAO—one in East Africa and one in Latin America.
- Assisting a workshop on agroforestry in Niger, West Africa, and supporting an agroforestry project in Panama.
- Providing training and technical advice in Brazil on wildfire suppression methods, and bringing several Brazilians to the United States for hands-on training in fire management, fire weather forecasting, safety, and use of prescribed fire.
- Assisting the establishment of "Twinning Relationships" between specific national forests and forestry organizations in Mali, West Africa, and Costa Rica.

## COOPERATIVE FIRE PROTECTION

Fire and Aviation Management activities on the National Forest System are administered under the leadership of the State and Private Forestry branch. For accomplishments for FY 1991, see the National Forest System, Chapter 2.

Cooperative fire protection encompasses several programs that provide organizational assistance, training, equipment, fire prevention materials, and financial assistance to State and local fire protection organizations. These State and local organizations, responsible for fire protection on non-Federal lands, match Federal funds on a 50-percent or larger basis. This partnership ensures cost-effective and responsive fire protection organizations within all the States and several territories.

### Federal Excess Personal Property (FEPP)

Through this program, the Forest Service loans used Federal property to State and local firefighting organizations. The original cost of the property loaned in FY 1991 was approximately $40 million. The Forest Service also acquired and loaned 26 medium-sized helicopters to State fire organizations.

Equipment on loan to the States includes 20,000 vehicles, including off-road vehicles, helicopters, and fixed-wing aircraft. Shop equipment for vehicle maintenance is also loaned to some States. The Federal Excess Personal Property Program provides equipment to many small communities that cannot afford to purchase new or used fire equipment. These small communities use a variety of fund-raising methods to generate enough money to convert these military vehicles into useful fire protection equipment.

### Rural Community Fire Protection (RCFP)

Through the USDA Farmers Home Administration (FmHA) appropriation, the Forest Service administers the Rural Community Fire Protection Program, which makes funds available to rural fire departments serving communities with populations of less than 10,000 persons. Figure 49 shows how cooperators used the $3.5 million Federal share. In FY 1991, State Foresters approved 3,000 applications from communities in all 50 States and three Territories.

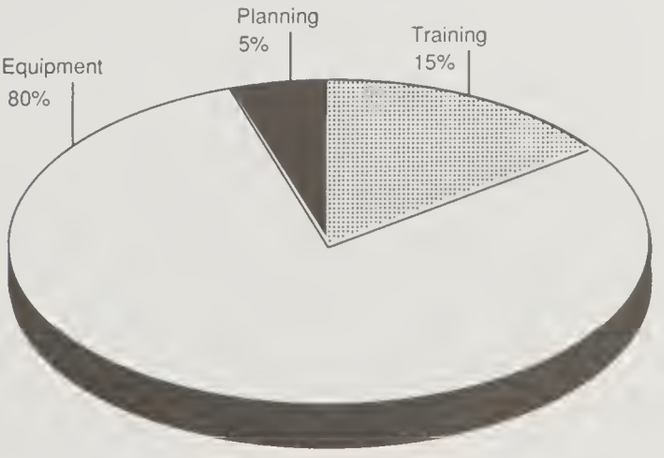
### Rural Fire Prevention and Control

In FY 1991, the States used $11 million in Federal grant funds for a variety of programs to improve firefighting resource efficiency and availability for assignments throughout the Nation. Activities included compiling fire statistical information; developing and transferring new technology; assisting with fire analysis; purchasing equipment; sharing resources; training; and implementing safe, efficient fire protection programs.

### Cooperative Forest Fire Prevention

Cooperative forest fire prevention and extensive outreach brought fire prevention messages to the public, primarily through the Smokey Bear program. This year marked the 50th year of cooperation with the Advertising Council, which arranges production and media distribution of fire prevention messages. In FY 1991, 10,000 newspapers, 3,000 magazines, 9,000 radio stations, and 7,500 television stations received fire prevention advertisements.

Figure 49.
**Rural Community Fire Protection—Forest Service Assistance to Local Organizations**




Farmers Home Administration Appropriation - Total: $3.5 Million

Outdoor advertisers throughout the country also use this prevention information. The equivalent market cost of these contributed fire prevention advertisements is estimated at $85 million.

Local fire protection organizations sponsored a wide variety of prevention activities involving Smokey Bear. Smokey reached diverse groups through trade fairs, State fairs, county fairs, sporting events, and other local events. To receive permission to use the Smokey logo, the Forest Service receives license and royalty fees from companies marketing Smokey materials. In FY 1991, the Forest Service administered 50 licenses, generating revenues of approximately $65,000 in royalties.

### Wildland/Urban Fire Protection

This initiative, started by the Forest Service in cooperation with the National Fire Protection Association in 1986, was begun in response to increases in the number of structures and homes that were burned down, in and adjacent to the National Forest System, as the result of wildfires. The initiative's main objective is to get an awareness and commitment for "Fire Safing" from everyone with a stake in the problem—not just firefighting agencies but homeowners, insurance companies, architects, and community planners and developers.

The Forest Service, the U.S. Fire Administration, the Bureau of Land Management, and the National Association of State Foresters support the initiative, both financially and with personnel. The Forest Service serves as coordinator for the agencies and for the effort.

In FY 1991, the Wildland/Urban Fire Protection initiative produced materials to increase awareness as a way to reduce fire losses where homes and wildlands intermix. Publications included four issues of "Wildland Fire Management Briefing Newsletter," a case study of Michigan's Stephen Bridge Road Fire, and the second edition of "Wildfire Strikes Home!" A program broadcast nationally via satellite brought two new videos: "Wildland Fire Fighting Techniques" and "Interface Planning" to a wide audience.

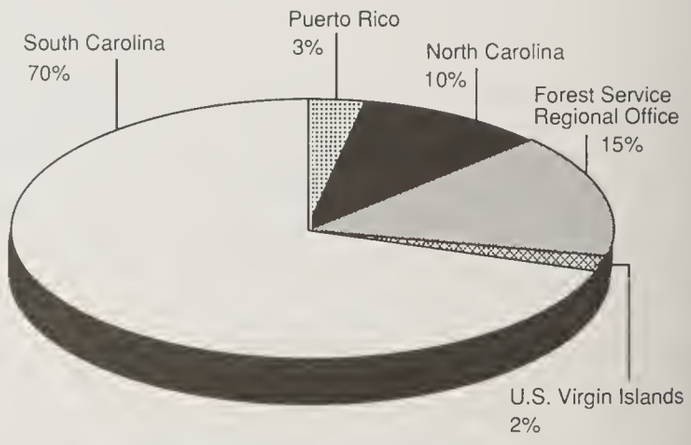
Table 53 reflects the acres of land protected under the Cooperative Forestry Assistance Act for calendar year 1991.

### Hurricane Hugo Fire Protection Funds

In FY 1991, Congress earmarked fire protection funds for State and private lands to mitigate the effects of Hurricane Hugo. Figure 50 shows how the funds were allocated among the affected States and Territories. Puerto Rico and the Virgin Islands used funds for fire-related training and technical assistance. North Carolina and South Carolina increased fire preparedness, mitigated fuel hazards, and provided fire-related training and technical assistance.

*Firefighters were able to prevent the wildfire from destroying this home.* Photo by Tom Iraci

Figure 50.
**Hurricane Hugo Cleanup—State and Private Funds**




Distribution of Funds

*Forest Service Chief McArdle (1952-1962).*

*"...Farm woodland and other small private forests hold the key to this Nation's future timber supply. These lands, generally in poor condition, are the greatest potential source of wood fiber. Producing more wood on these lands requires concerted effort by State and Federal foresters, forest industries, and the landowners." Richard E. McArdle*

*In 1954, Boy Scouts planted trees on the Yazoo-Little Tallahatchie flood prevention project.* F S Photo

*The Yazoo-Little Tallahatchie flood prevention project was a cooperative activity between farmers and the Forest Service during the 1950's in Mississippi. This project planted 80,000 trees over several years.* F.S Photo


*Poster depicting the 50th anniversary of the Forest Service in 1955.* F.S. Photo

## Chapter 4

# International Forestry

*Global Forestry — Interaction Among Nations*

Photo by Ron Libby

## INTRODUCTION

### New Deputy Chief for International Forestry

On June 26, 1991, the Secretary of Agriculture announced the creation of a Forest Service Office of International Forestry. The International Forestry Office, to be led by a new Deputy Chief, was authorized by Title XXIV, the Global Climate Change Prevention Act of 1990. International Forestry coordinates Forest Service programs in tropical forestry technical assistance and training, cooperative work with the U.S. Agency for International Development, international scientific and technical exchanges and cooperative research with other countries, and support to international organizations responsible for global forestry issues.

### New Authorities and Policy Leadership

The Forest Service role in international forestry was increased by the International Forestry Cooperation Act of 1990. The act authorizes the Secretary of Agriculture to provide technical assistance and equipment, share natural resources skills, cooperate with domestic and international organizations, and engage in scientific exchanges and cooperative research with key countries in order to reduce greenhouse gases related to potential global warming. The Forest Service can now respond more fully to requests for technical expertise in sustainable tropical forest development and help to counter the threat of tropical deforestation. The act also authorizes the Forest Service to expand its Institute of Tropical Forestry in Puerto Rico into a full-fledged international institute.

## WORLD FORESTRY CONGRESS

A delegation from the United States, headed by the Deputy Chief for International Forestry, participated in the 10th World Forestry Congress in Paris, September 17-26, 1991. The U.S. delegation paid particular attention to several main issues and concerns discussed at the Congress: deforestation, social awareness of forest uses, forest valuation, relation of forestry to other sectors, production vs. environmental forestry, models, fragmentation of forest lands, financing of international activities, biodiversity, agricultural production, and tracking of forest cover.

## FORESTRY SUPPORT TO THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

In March 1991, the Forest Service, the USDA Office of International Cooperation and Development, and the Peace Corps signed a 10-year, $45 million agreement with the U.S. Agency for International Development (USAID), which will promote the contribution of natural resources to sustainable development worldwide and strengthen the capacity of forest management institutions in tropical developing countries. This agreement extends the life of the Forestry Support Program (FSP), in which the Forest Service provides technical assistance and training overseas.

*International Forestry Deputy Chief Jeff Sirmon signs a memorandum of understanding with Dr. Tania Munhoz, (former) President of IBAMA, Brazil's Agency for the Environment.* Photo by Robert Szaro

Technical assistance and trainers were provided for the following activities:

- Conducted a nature tourism assessment and a natural forest management field program in Kalimantan, Indonesia.
- Provided law enforcement assistance to Costa Rica.
- Designed a USAID environmental protection project in the South Pacific and a USAID natural resources management project in Nicaragua.
- Evaluated a Peace Corps/USAID community forestry project in Ghana.
- Developed an environmental assessment of proposed USAID forest management activities in Panama.
- Developed an economic impact assessment of agroforestry systems in Haiti.
- Analyzed an institutional and natural resource policy in Uganda.
- Provided technical advice on low-impact roads in Guinea and Ghana.
- Investigated the cause of dieback of Neem (*Azadirachta indica*) in Niger, which has potentially serious implications for plantations across the Sahel.
- Hosted a workshop on financial and economic analysis of agroforestry systems, for 40 participants from throughout the world, in cooperation with the Nitrogen Fixing Tree Association in Hawaii.
- Cooperated with USAID/India to fund technical exchanges in biometrics, silviculture, and resource economics.
- Concluded an agreement with the American Forestry Association to provide on-the-job training internships for foresters from developing countries already in graduate school programs in the United States.
- Assembled a database on USAID-funded tropical forestry projects. This is the primary information source for USAID's reports to Congress on tropical forests and biological diversity.
- Generated guidelines to address the needs of refugees and displaced persons associated with natural resource development projects.
- Cooperated with USAID to provide travel grants to foresters from developing countries to attend the 10th World Forestry Congress (five grants), the International Seminar on Forestry Administration and Management (two grants), and the World Bank Forest Conservation and Management Conference for Africa (four grants) in the Ivory Coast.

*Ghanaian community nursery workers plant teak seed under the light shade of leuceana trees at a community nursery in northern Ghana, West Africa.* Photo by Bill Helin

- Updated and enhanced computer access to the Forest Service international skills roster, which includes current biodata on 2,500 individuals. Used the roster to identify candidates for some 200 international forestry assignments.

- Organized a series of national-level workshops on women and natural resources in Mali, the Dominican Republic, and El Salvador to improve women's participation in forestry and natural resources management projects.

- Produced and distributed: "Training and Educational Opportunities in Agroforestry—A Directory of Institutions in the U.S. and Overseas," "Profiles of USA Natural Resources Schools," and a "Guide to Grants and Fellowships in International Forestry and Natural Resources."

### Tropical Forestry Program

Tropical Forestry Program activities are under the leadership of the State and Private Forestry branch of the Forest Service. For FY 1991 accomplishments, see State and Private Forestry, Chapter 3.

### DISASTER ASSISTANCE SUPPORT TO THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

The Disaster Assistance Support Program (DASP) continued to provide emergency response, preparedness, prevention, and mitigation assistance to natural and human-induced disasters around the globe, in support of the U.S. Office of Foreign Disaster Assistance (OFDA).

Major accomplishments of DASP during FY 1991 include:

- Provided for two Forest Service logistics specialists to serve as members on the Disaster Assistance Response Team (DART) that assisted Operation Provide Comfort, which provided humanitarian assistance to the 400,000 displaced Kurdish persons in Turkey and northern Iraq during the Gulf War. Their objective was to coordinate U.S. relief efforts with the U.S. military, other donor countries, and international organizations.

- Organized a visit by nine disaster management officials from the Soviet Union. The delegation met with senior staffs of

*Kurdish refugee camp inside Iraq.* Photo by Ron Libby

*By converting a stand of mangroves into small pools, these Thai farmers are able to harvest a crop of tiger shrimp.* Photo by Gyde Lund

cooperating agencies in Washington DC, visited the Tennessee Emergency Management Agency, the California Office of Emergency Services, and sites in San Francisco and Oakland that were damaged in the 1989 Loma Prieta earthquake. This visit resulted in a memorandum of understanding, signed by Presidents Bush and Gorbachev at the Moscow summit in July 1990 for cooperation in preventing and responding to natural and human-induced disaster.

- Assisted in developing guidelines for coordinating international search and rescue efforts following disasters. Proposed the concept of on-site coordination centers modeled on the U.S. wildfire suppression system. This concept was adopted by the United Nations Disaster Relief Organization (UNDRO) as one of four protocols of international search and rescue operations.

- Revised the Disaster Assistance Response Team Manual, modeled after the Forest Service's incident command system and the Fireline Handbook. The DART concept provides a standard system for assisting U.S. embassies and host countries to better manage the aftereffects of a major disaster.

- In June 1991, dispatched a USDA soil scientist to the Philippines to assess the medium- and long-term effects of the Mt. Pinatubo volcanic eruption.

- In August 1991, conducted a needs assessment of the displaced persons situation in Sierra Leone, resulting from civil strife in neighboring Liberia. Identified areas where the U.S. Embassy and the relief community could improve their well-being.

## INTERNATIONAL FIRE ASSISTANCE

In FY 1991, Forest Service fire management personnel assisted many countries by providing training and new technology in wildfire prevention and suppression. In exchange, the United States gained valuable experience in a wide variety of conditions and locations. A few of the countries assisted were Brazil, Israel, Mexico, Spain, Italy, and Nicaragua.

## INTERNATIONAL PEST MANAGEMENT ASSISTANCE

**Africa**. Three species of aphids have been accidentally introduced into eastern and southern Africa. These aphids have caused $1 billion in damage in nonnative cypress and pine plantations.

The Forest Service and the International Development and Research Council of Canada (IDRC) provided financial support for a workshop organized by the Kenya Forestry Research Institute

(KEFRI) in collaboration with the Food and Agriculture Organization of the United Nations and the International Institute of Biological Control (IIBC) in the United Kingdom. The workshop, a forum to exchange information and plan strategies for control of the aphids, was participated in by eight African nations, the United Nations Food Agriculture Organization (FAO), the United Kingdom, Japan, and Canada, as well as the Forest Service. As a result of the needs evaluation performed at the workshop, the Forest Service is collecting parasites in the United States to be tested for their biological control value against the aphids. Participating organizations are setting up networks to exchange information, share skills, and provide natural enemies and resistant strains of trees.

**Republic of China**. A delegation of forest health management specialists began a program of scientific and technical exchanges with the Republic of China. The delegation evaluated, on-site, the current forest pest situation using U.S. forest health monitoring and evaluation techniques and integrated forest health management strategies. Additional exchanges are planned, and the Taiwanese have agreed to host and help fund the resource technology conference at Taipei, Taiwan, in 1992.

*Forest Service entomologists study beetle infestations in the People's Republic of China.* Photo by Richard Myre

**People's Republic of China (PRC)**. As part of the same program exchange, the Forest Service visited Beijing and several other areas in the PRC to review the Chinese parasite rearing program and their field implementation of biological control.

## SCIENTIFIC EXCHANGE AND COOPERATIVE RESEARCH

Forest Service scientists participated in 11 cooperative research programs in four countries—Pakistan, Poland, the Republic of China, and Yugoslavia—under the USDA/OICD (Office of International Cooperation and Development) Special Foreign Currency Research Program. Subject matter included biological control of insects and diseases, wildlife habitat, reforestation of disturbed sites, effects of acid deposition on tree growth, and wood products.

Fifteen Forest Service technical assistance trips were made to 10 countries under the USDA/OICD Scientific and Technical Exchange Program. These included cooperation on pulp and paper technology with Finland and Sweden; insect and disease control work with Australia, the PRC, Japan, and New Zealand; site preparation on poorly drained soils with the Republic of Ireland; physiology and genetics of drought-tolerant hardwoods with Italy; and others.

A long-term program of cooperative research on lowland tropical forest ecosystems was begun with Brazil, with research sites in the Amazon and Puerto Rico. Cooperation was strengthened with Brazil on wildfire prevention and fire suppression techniques.

An agreement was signed by the U.S. Interagency Grizzly Bear Committee and several institutes of the Russian Academy of Sciences to jointly develop reliable techniques for successful coexistence between humans and brown bears.

An International Boreal Forestry Research Association was initiated, with Canada, the former Soviet Union, and the United States as charter members. The purpose of the association is to share information and technology, and to carry out coordinated research programs in two technical areas: 1) inventory, monitoring, and classification of vegetation; and 2) global change and ecosystem function.

### International Visitors

During FY 1991, Forest Service field units hosted some 380 international visitors from 50 countries, providing orientation and training. Senior forest managers from 21 countries in Africa, Asia, Latin America, and the Caribbean attended the Seventh International Seminar on Forest Administration and Management, which was given in cooperation with the University of Michigan.

*Brazilian foresters review sections of the rain forest with Chief F. Dale Robertson and Dave Harcharik, Acting Associate Deputy Chief for International Forestry.* Photo by Jeff Sirmon

*A research reconnaissance crew in camp at the Fort Valley Experiment Station, Coconino National Forest, Arizona, in 1910.* F.S. Photo

*First home of the Forest Products Laboratory in Madison, Wisconsin (circa 1910).* F.S Photo

*Pioneer Forest Service researcher Raphael Zon (white shirt) takes the first load over the new road carrying office equipment for the Priest River Experiment Station in Idaho (1911).* F.S. Photo

# Chapter 5

# Forest Research

*Advancing Knowledge for Society's Needs*

Photo by Jeffrey Tinsley

## INTRODUCTION

### The Research Mission

The Forest Service has the most extensive integrated forestry research program in the world. The program is designed to enhance the environmental quality of America's 1.6 billion acres of forests and associated rangelands, while improving resource conservation, productivity, and protection, as well as increasing the overall effectiveness of forest management. The Research program provides the scientific basis for numerous critical forest and rangeland management decisions for the Nation and the world.

*A meteorological station on the Coweeta Experimental Forest in North Carolina measures run-off in 1941.* Photo by J. A. Lieberman

The 1990 RPA Program called for an increase in Research program efforts "... to enhance understanding of complex ecological interactions that support resource sustainability." In identifying the future role of the Forest Service in providing scientific information on natural resource issues, the 1990 RPA Program also indicated the agency should "...increase research efforts to understand how people use and value natural resources," and "increase understanding of and expand resource options to help managers enhance compatibility among resource uses."

Using the direction of the 1990 RPA Program and the recently adopted Strategy For The 90's For Forest Service Research, the agency's 714 scientists conducted or participated in more than 2,800 studies at 74 locations worldwide. The Research program is based nationally at the Forest Products Laboratory in Madison, Wisconsin, and at eight regional experiment stations, each having several field facilities.

In FY 1991, appropriations for Forest Service Research totaled approximately $168 million, of which 11 percent ($19 million) supported cooperative studies with colleges, universities, industry, and other domestic and international organizations (tables 54 through 56). Supplemental research support (approximately $3 million) was received from other government agencies and various private sector institutions.

The Research challenge cost-share program in FY 1991 had 26 non-Federal cooperators for 15 research projects of mutual interest. Contributions from these cooperators totaled about $517,000. This program expanded research into several areas benefiting non-Federal clients on such diverse topics as: new technology to eradicate pine wood nematodes in lumber slated for export, dimensional stability and mechanical properties of hardboard manufactured from recycled newspapers, and influences of selected forest management practices on black bear conservation.

### Broad Research Areas

Forest Service Research is funded under five broad budget line items: forest protection, resource analysis, forest management, forest environment, and forest products and harvesting. Continuing long-term research is conducted in each of the budget line items, providing the foundation for the entire program. Much of the scientific knowledge methodically developed over time in the foundation portion of the program is often the only baseline information of its type in the world.

Forest Protection Research (FPR) develops improved methods for preventing, predicting, controlling, and reducing the effects of wildfires, insects, and diseases. Basic knowledge is sought about forest/atmosphere interactions needed to monitor and predict global change effects on forests and pest dynamics caused by climate, air pollutants, and other changing atmospheric factors. The program emphasizes a broadening of the knowledge base of beneficial functions and uses of fire, insects, and micro-organisms needed to maintain healthy, productive forest and rangeland ecosystems.

Resource Analysis Research (RAR) provides a scientific basis for assessing the current condition and outlook for forest land resources, forest product investments, and markets, including evaluation of international trade. RAR also develops methods for improving management of outdoor recreation, wilderness, and urban forest resources.

The Forest Management Research (FMR) program is directed toward achieving higher levels of health, quality, and productivity from forest lands by developing environmentally, biologically, and economically sound forest management practices through science. Basic research is directed toward understanding the physical, biological, and genetic factors that control the development of individual trees, forest stands, and natural ecosystems. Emphasis is placed, as well, on science that maintains and promotes biological diversity.

Forest Environment Research (FER) provides leadership for developing the knowledge, techniques, and strategies needed to manage, protect, or enhance forest, rangeland, and associated aquatic ecosystems. Emphasis is on sustaining ecological processes; biodiversity; and water, wildlife and fish resources.

Forest Products and Harvesting Research (FPHR) provides the science and technology to harvest, produce, and use wood products in ways that are efficient, safe, and environmentally beneficial. Research has concentrated on obtaining the optimum yield from the harvested forest resource through environmentally acceptable processing systems and an enhanced understanding of the resource. Research has developed improved wood-based materials that are economical and meet consumers' needs for safe and durable forest products.

### Special Emphasis Areas

In addition to the foundation program of research, special emphasis is placed each year on selected critical national and/or international problems. For FY 1991, the national problems were: global change, water quality, threatened and endangered species, declining forest-based economies in rural America, southern forest productivity, and catastrophic forest fires.

Research results are disseminated through symposia, workshops, direct contacts, and numerous publications (table 57). Publications are frequently prepared on the same subject for both consumer use and scientific peer review.

### Research Program Accomplishments

Research program accomplishments follow from the four themes in the 1990 RPA Program: 1) Enhanced Recreation, Wildlife, and Fisheries Resources, in which Research is directed to focus on how to enhance the compatibility of multiple resource uses on all lands; 2) Environmentally Acceptable Commodity Production, in which Research is directed to develop a better understanding of basic ecology and methods of management that reduce environmental impacts and improve resource inventory data; 3) Improved Scientific Knowledge About Natural Resources, in which Research is directed to increase the study of forest and rangeland ecosystems to expand the array of resource production opportunities and to protect the environmental integrity of the resource base; and 4) Response to Global Resource Issues, in which Research is directed to expand efforts to better understand global ecological interactions.

The accomplishments described below highlight the contribution of the FY 1991 Research program to the broad direction to the four themes of the 1990 RPA Program. Individual research studies are established and authorized to be conducted over 5-year time periods. Therefore, the research accomplishments reported here are, in most instances, the culmination of several years' work.

## RESEARCH TO ENHANCE RECREATION, WILDLIFE, AND FISHERIES RESOURCES

### Evaluation of Recreation on TVA Lakes

Researchers from the Southeastern Forest Experiment Station, in cooperation with the University of Georgia, developed methods for measuring the economic benefits of recreation to local and regional economies. Using these methods, they demonstrated benefits of keeping water levels high in Tennessee Valley Authority (TVA) lakes during the summer recreation season, even if production of hydro-electric power were reduced. It was shown that delaying summer drawdown by 1 month would yield over $12 million in additional household and business income in the region. This research resulted in a resource management change (higher lake levels in summer) to better meet the recreation needs of the Nation, while still helping the original TVA goal of improving the economy of the region.

### Threatened, Endangered, and Sensitive Species

The Forest Service Research program mission for threatened, endangered, and sensitive (TES) species is to recover threatened and endangered species, and to forestall population declines that would require the Federal listing of species that are now considered sensitive. Research goals include: 1) identification of resource requirements for TES species, 2) determination of organism and population response to habitat manipulation, 3) development of population viability assessments, and 4) development of recovery and management technologies.

With a $1.8-million increase in funding for TES research in FY 1991, Forest Service researchers were able to expand their research program to include several additional TES plants and animals. Researchers initiated research on the pine marten in eastern Oregon, fisher in northern California, northern goshawk in Arizona and the Central Rockies, the Colorado spinedace (a fish) in Arizona, the swift fox in the northern Great Plains, and on the interactions between great horned owls and Mexican spotted owls in Arizona. The agency's research efforts on TES plants were greatly expanded with basic ecological research begun on several rare plant species in eastern Washington, new research on the seed ecology of a sensitive *Carex* in riparian areas in Idaho, and development of a major TES plant research program in the Southeast. The Forest Service also accelerated its research on ways to restore the native forest habitats of several species of endangered birds in Hawaii.

Major accomplishments for FY 1991 include:

- The completion of research on the use of shelterwood cuts by red-cockaded woodpeckers in the South.
- Discovery of the major causes of cavity-tree mortality in red-cockaded woodpecker nesting colonies.
- Development of a spatially explicit population simulation model for the northern spotted owl that will assess population viability for the owl under different habitat management strategies.
- Development of a landscape-level model for predicting the distribution of suitable Mexican spotted owl habitat.
- Development of a model to predict population trends for the Kirtland's warbler with changes in the quality and quantity of suitable habitat in the jack pine forests of Michigan.

- Development of both on-shore and off-shore survey methods for detecting trends in marbled murrelet populations along the Pacific coast from Alaska to California.

- Development and evaluation of habitat restoration techniques for TES anadromous fish in the Columbia River Basin.

- Development of a generalized framework for conservation planning for threatened and endangered species that makes use of recent research results.

- Determination of the nutritive value of the primary foods consumed by grizzly bears and development of methods to determine carrying capacity of a particular habitat for grizzly bears.

Much of this research is done in cooperation with the National Forest System, Bureau of Land Management, State natural resource agencies, major universities, the timber industry, Bonneville Power Authority, and local interest groups.

### California Spotted Owls

Researchers at the Pacific Southwest Station, working with the California spotted owl in the southern Sierra Nevada, compared the habitat and diets of owls utilizing oakland woodland habitats, with those using higher elevation coniferous forests.

Finding: Despite differences in diet and in habitat elevations, the habitat requirements of oak woodland owls are similar to those of its neighbor in the coniferous forest. Both select sites with dense canopy cover (70 percent or more) for roosting and nesting, forage in areas with moderate to heavy canopy cover (40 percent or greater), and avoid open sites where canopy cover is less than 39 percent. This repeated pattern of significant use of high-density stands and lesser use of low-density stands makes a compelling argument that dense stands are important to spotted owls in the Sierra Nevada. These results are being used to develop guidelines for managing forests with California spotted owls.

### Columbia Basin Salmon

The Columbia Basin salmon is under study for possible listing as a threatened species under the Threatened and Endangered Species Act. Pacific Northwest Research Station scientists have been studying the effects of human and natural disturbances on anadromous fish habitat for the past 10 years. Part of the study has focused on trends in the condition of stream habitat by comparing 50-year-old survey records, made between 1936 and 1942, with resurveys done in the Columbia River Basin between 1987 and 1990.

Finding: The recent surveys indicate a loss of 50 to 75 percent of large pools on both public and private lands over the 50-year period and significant losses in spawning habitat in some areas. The quality of wilderness habitats has either remained constant or improved during the period. Some improvements in pool frequency since 1940 were observed in areas where Forest Service stream restoration practices had been applied during the past decade.

*An adult northern spotted owl.* Photo by Tom Iraci

### Bird Habitats Summarized

A publication produced in FY 1991 by scientists from the Northeastern Forest Experiment Station, the Rocky Mountain Forest and Range Experiment Station, the USDI Fish and Wildlife Service, and the University of Wyoming provides land managers—foresters, wildlife biologists, and range conservationists—across the United States with information on the assemblage of birds that potentially occur on the forest and/or rangelands that they administer.

Finding: This book, "Forest and Rangeland Birds of the United States," includes a discussion of the general patterns of bird distribution across the United States. Life histories are provided for 518 species, including information on range, status, habitat, special habitat requirements, nesting, food, and key references. A series of tables list the species that breed or winter in 10 eastern and 10 western forest types, and in 28 rangeland, desert, and other nonforest habitats.

### Cheatgrass Invasion and Shrub Die-Off

Intermountain Station researchers, in partnership with the Shrub Research Consortium, compiled current information to help wildlife and range managers restore native plants and improve range conditions in the Intermountain Area. Over 100 million acres of the interior West have converted to cheatgrass and other annual grasses.

Cheatgrass ranges provide a ready source of flash fuels that lead to frequent rangeland wildfires. The cheatgrass/wildfire cycle results in a loss of diversity in both the native plants of the region and the wildlife that are associated with these ecosystems. Station scientists cooperated with universities, the Utah Division of Wildlife Resources, the Idaho Fish and Game Department, and the U.S. Bureau of Land Management to find ways to break the catastrophic cheatgrass/wildfire cycle to restore natural biodiversity and to return valuable browse to the big game winter range.

Finding: As the rangeland wildfire frequency is reduced from the current 3-5 year cycle to the historical 30-72 year interval, native perennial grasses will replace annuals, improving range conditions for both livestock and wildlife.

*Shrub Sciences Laboratory geneticists conduct experiments on genetic shrub variations aimed at restoring damaged ecosystems.* Photo by Dave Tippets

### Effects of Management on Fish Habitat

Management activities on forest and rangelands have often affected fish habitats. Forest and rangeland management techniques are essential to ensure that fish habitats on public lands remain productive and that fish populations are maintained at levels meeting recreational, commercial, and subsistence demands.

Finding: Research by the Pacific Northwest Station and cooperators has resulted in publication of a book titled "Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats." The direct and indirect effects exerted on salmonid habitats by logging, forest chemicals, silviculture, timber transportation and processing, livestock grazing, mining, road building, and recreation are treated in detail. Best management practices to protect stream and riparian habitats are emphasized, and rehabilitation of degraded habitats is given extensive treatment.

### Decline of Neotropical Migratory Birds

In the Midwest, the number of forest-interior neotropical migrant birds has been decreasing, with concern expressed that clearcutting is responsible for the decline in numbers.

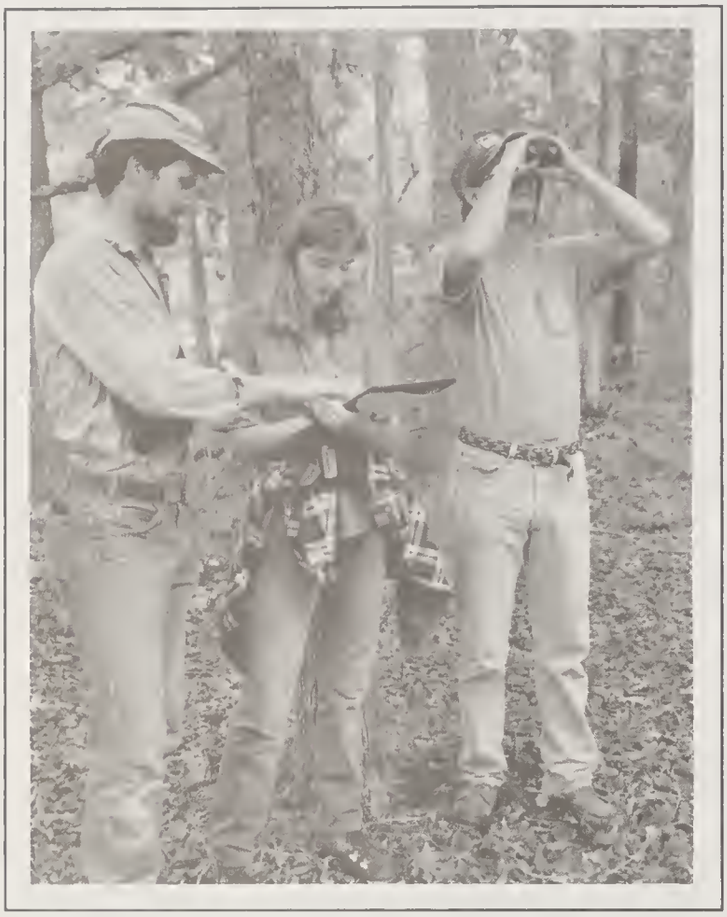
Finding: North Central Station scientists have found that clearcutting apparently reduced numbers of some species of neotropical migrants that are dependent on mature forests, but not to an extent that populations would be threatened. Densities of other forest-interior migrant birds that could make use of early and mid-successional even-aged stands increased. This research demonstrates that in extensively forested areas such as the Missouri Ozarks, clearcutting, when appropriately applied, will not diminish populations of forest-interior migrant birds.

*Magnolia warblers are neotropical migrants with a distinctively banded tail.* Photo by Jay Hutchinson

### Old-Growth Douglas-Fir Forests

Over one-quarter of the forested lands managed by the Forest Service in Washington, Oregon, and northern California can be classified as old-growth. However, little information was available on the basic ecology and wildlife species that live in these forests. In 1983, the Forest Service initiated a series of studies on the vegetation and wildlife of old-growth Douglas-fir forests using scientists from the Pacific Northwest and Pacific Southwest Research Stations.

Finding: The results of these studies have been compiled into an important new book titled "Wildlife and Vegetation of



*Forest Service research biologists instruct summer employees on surveying neotropical migratory birds.* Photo by Jay Hutchinson

Unmanaged Douglas-Fir Forests," published by the Pacific Northwest Research Station (PNW-GTR-285). This book contains 37 scientific and management-related papers from scientists, biologists, and managers from the Forest Service, USDI Fish and Wildlife Service, University of Washington, Washington State University, Oregon State University, and Humboldt State University. The papers presented identify those animal and plant species that are dependent upon or find optimal habitat in old-growth Douglas-fir forests discuss the various definitions of "old-growth" and review efforts to inventory these ecosystems and identify the biological requirements and ecological relationships of species associated with old-growth Douglas-fir forests. Twenty-four species, or groups of species, were identified as "closely associated" with these old-growth forests. An additional 68 species were identified as "associated" with old-growth Douglas-fir forests.

### Burning "Wetlands" on the Dry Great Plains

Woody draws and stands of trees and shrubs along permanent and intermittent streams are highly valuable for wildlife in the northern Great Plains. Livestock grazing and the elimination of fire, however, have allowed invading species such as leafy spurge and Kentucky bluegrass to prevent regeneration of important fire-adapted trees and shrubs.

Finding: Range scientists at the Rocky Mountain Station's Rapid City, South Dakota, laboratory have developed the techniques and timing for using prescribed fire to reduce the invaders and to encourage desirable native woody species in these special Great Plains riparian habitats which are crucial for wildlife.

*Prescribed burning helps rejuvenate deteriorating woodlands growing along small streambeds in the northern Great Plains, which are prime wildlife habitat.* F.S. Photo

## RESEARCH TO PROVIDE FOR ENVIRONMENTALLY ACCEPTABLE COMMODITY PRODUCTION

### Effects of Timber Management on Fish Habitat

The quality and productivity of fish habitat are affected by the amount of sediment transported by streams. Short-term monitoring, with traditional methods of collecting data on suspended sediment concentrations, leads to questionable estimates of stream sediment loads. New methods are needed because the monitoring of long-term effects can take a century or more.

Finding: Researchers at the Pacific Southwest Research Station found that modern, programmable data recorders can be used to obtain time-stratified samples simply and efficiently. The estimates derived have known levels of performance and estimable variance. For longer term evaluations, simulations were used effectively to identify critical gaps in knowledge that require additional research.

### Thinning Rust-Infected Southern Pine

Scientists from the Southeastern Forest Experiment Station have developed statistical techniques for predicting when slash and loblolly pines infected with fusiform rust will die from the disease.

Finding: The results were used to develop guidelines for thinning rust-infected pine plantations for trees of merchantable size. Stand, tree, and infection characteristics are used to determine risk classes and to establish priorities for tree removal.

*Most southern pines that die from fusiform rust infection have more than one stem gall. Removal of high-risk trees improves stand quality.* Photo by R.P. Belanger

### Successful Forest Regeneration

Seedling survival under natural conditions is inversely proportional to the number of seeds produced in a given year. Improving the odds of germination becomes extremely important when using genetically improved seeds and when reforesting difficult sites. Scientists at the Southern, North Central, Intermountain, and Pacific Northwest Stations improved the odds for both seed germination and seedling establishment through basic and applied research.

Finding: Field trials have identified several factors causing regeneration failures. Recommendations have been developed for reducing those failures. Improved seedling establishment and survival are obtained only when the necessary steps for reforestation are properly taken: producing high-quality seedlings; complete site preparation; careful lifting, storing and transporting of seedlings; proper seedling planting, including controlling planting depth; and appropriate postplanting treatments to promote height growth.

### Revegetation for Reclamation Efforts

Intermountain Station scientists have established techniques and identified plants for restoring disturbed ecosystems in extreme environments. A major gold discovery was located between Yellowstone National Park and the Absaroka-Beartooth Wilderness. The proposed mine would be both in the fragile alpine zone and within the recovery area for the grizzly bear, generating concern about a significant land disturbance within such an ecologically sensitive area.

Finding: Scientists provided the Noranda Mining Company with information needed to prepare a reclamation plan based on study data collected from the harsh environment of the proposed mining site.

*Intermountain Station plant physiologist checks climatic data at the McLaren Mine revegetation study site , north of Yellowstone National Park.* Photo by David Tippets

### Southern Bottomland Hardwoods

Reforestation is one of the first steps in restoring southern agricultural fields to their former function and value as wetland and/or bottomland hardwood forests. Research scientists at the Southern Forest Experiment Station's Hardwoods Laboratory in Mississippi completed studies that provide the technology necessary to reestablish bottomland hardwood tree species on old fields or cleared forests.

Finding: Guidelines for planting seedlings of most species, or direct-seeding oaks and other hard mast species, have been published, providing landowners the necessary information for successful reforestation efforts. While most useful in the lower Mississippi River Valley, the techniques apply to reforesting bottomland hardwoods or wetland mitigation and restoration throughout the United States.

### Prescribed Burns for Slash Reduction

Using prescribed burns to reduce forest fuels or slash residue following harvesting is necessary for preventing wildfires, reducing the effects of wildfire, and facilitating reforestation. Predicting and controlling the amount of consumption of the fuels to meet various management objectives is difficult.

Finding: Intermountain Station researchers established relationships between duff moisture and other fuel factors that enabled them to develop guidelines for slash burning prescriptions. These guidelines are used to make burning prescriptions to minimize smoke, reduce fuel, and prepare seed beds while leaving enough organic material on the site to maintain soil productivity.

### Rejuvenating Old Rangeland Data

Knowledge of trends in rangeland condition is important to public rangeland managers as they develop their land management plans. However, existing rangeland condition data are of two very different types. Early data on rangeland condition were collected by a technique called the "Parker 3-step," which gave only an index to rangeland condition. More recent surveys of rangeland condition have used plant cover values.

Finding: Scientists at the Rocky Mountain Station's Albuquerque laboratory, working with cooperators at Arizona State University, have established the relationship between old "Parker" frequency data and more quantitative plant cover values. With a simple handbook for data conversion, 30 minutes of field time, and an hour on an office computer, rangeland managers can convert 40-year-old data into a common base for comparison with new information gathered by more scientific methods.

### Quality of Forest Products

The future of the timber economy in the Pacific Northwest depends on decisions about land management that are being made today. Research by the Pacific Northwest Research Station demonstrates the importance of forest management decisions on the utility and value of wood products. A study of product recovery from young-growth Douglas-fir proved that stand conditions and management practices can result in significant changes in values.

*Using a new computer program and current plant cover data, range technicians can quickly convert old range data into a common base to evaluate range condition trends.* F.S. Photo

Finding: Differences in lumber grade, attributed to affects of knot size and juvenile wood, can affect lumber values up to $83 per thousand board feet—a reduction in value of about 40 percent. The study sampled trees from stands on private, State, and Federal lands representing a wide range of stand conditions and management practices. The research was conducted through a United States/Canadian stand management cooperative effort involving industry, other Federal agencies, and five major west coast universities in the United States and Canada.

## RESEARCH TO PROVIDE FOR IMPROVED SCIENTIFIC KNOWLEDGE ABOUT NATURAL RESOURCES

### Forest Health Monitoring

The health of forest ecosystems must be understood to be effectively protected and managed. The Forest Health Monitoring (FHM) Program was established to meet the requirements of the 1988 Forest Ecosystems and Atmospheric Pollution Research Act. Using a network of permanent study plots and experimental forests throughout the United States, coupled with remote sensing observations and pest surveys, the FHM program records and analyzes measurements of selected forest ecosystem characteristics. These data will serve as reference systems and/or baselines, enabling scientists to detect changes in forest ecosystems that may affect forest resilience and productivity.

### National Acid Precipitation Assessment Program

The first 10-year phase of the interagency National Acid Precipitation Assessment Program (NAPAP) ended in October 1990.

Twenty-seven final reports (table 57), called "States of Science and Technology," were produced. Agency research scientists did much of the research that was reported on forests and forest soils, and performed selected research on streams and lakes. Summaries of conclusions reached in the NAPAP reports were grouped as effects on forests, soils, and aquatic habitat.

**Effects on Forests**. Forests are exposed to acid deposition through rain, snow, and direct contact with acid-laden clouds. Currently no widespread forest damage in the United States is attributed to acid deposition alone.

Finding: Scientists have found that multiple stresses, such as cloud acidity, in combination with other factors (ozone, soil acidification, climate), contribute to reduced cold tolerance in high-elevation spruce-fir forests in the Eastern United States. This can contribute to damage to spruce-fir forests at cloud level during winters. Some adverse air pollution effects on forests in other regions of the country are associated with ozone, as a product of primary stress. This is the case with ponderosa and Jeffrey pines in California, and white pine in the East where forest composition is being affected. Ozone damage to tree leaves and needles has been identified in areas downwind of many major U.S. cities and industrial areas.

**Effects on Soils**. There is no evidence to indicate that forest health in general is significantly affected by acid deposition, or will be affected in the next 50 years. At low levels, nitrogen and sulfur pollutants have a fertilizer effect. However, as the nitrogen and sulfur levels build up in soils over time, models indicate problems will occur.

Finding: Changes in forest soils have been detected only in some sensitive soils in the Northeast under high acid deposition levels. Models project that continued acidic deposition will result in widespread, long-term damage in more soil types in the 50- to 100-year range.

**Effects of Aquatic Habitats**. At the time NAPAP was initiated, many believed that an increasing number of surface waters in the United States were being adversely affected by sulfur deposition from the atmosphere in the form of acid rain. As a result, aquatic communities, including fish, were thought to be at risk.

Finding: Research by scientists from the Forest Service and other agencies indicates that less than 5 percent of the lakes and 10 percent of the streams from the National Surface Water Survey are chronically acidic; they have lost their ability to neutralize acidic water. In specific regions, such as the Adirondack region of New York, up to 15 percent of the lakes greater than 10 acres in size are chronically acidic. Up to 12 percent of the streams in the Mid-Atlantic Highlands and the Coastal Plain are chronically acidic. Some acidic lakes in the Northeast have lost important recreational game fish such as brook trout and smallmouth bass.

### Atmospheric Stresses on Tree Growth

Another example of multiple atmospheric stresses affecting tree growth comes from studies by North Central Station scientists.

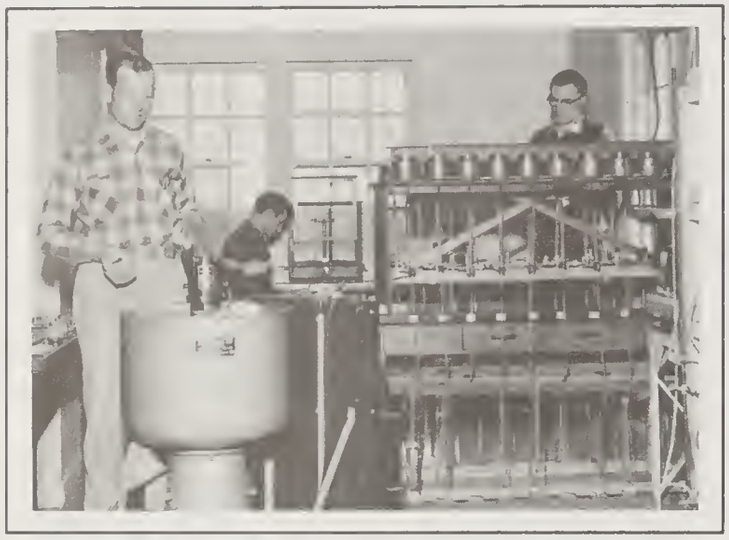
Finding: Scientists found correlative evidence that jack and red pine growth in the Lake States is adversely affected by high levels of sulfate deposition if the trees are already stressed by high temperatures and low rainfall. This finding is supported by the research of Canadian scientists who have shown that the jack pine ecosystem is adversely affected by multiple sequences of drought stress. While growing evidence of adverse impacts of multiple atmospheric stresses, especially climate and air pollution, point to greater complexity in studies to understand forest ecosystems, results will warn managers of previously unsuspected forest health problems.

*Much of the sulfate that accumulates in the winter snowpack flushes into streams, wetlands, and lakes in the spring. Water and sulfur content of the snowpack is measured.* Photo by Dwight Streblow

### Wildfire Recovery Practices

In response to the disastrous large-scale fires of 1987 and 1988, Congress passed The Wildfire Disaster Recovery Act of 1989 and established the National Commission on Wildfire Disasters. In response, Forest Service research concentrated its investigation on fire effects and behavior on the Yellowstone and California fire areas.

Finding: Researchers have discovered that the standard practice of seeding annual grasses following a wildfire nearly eliminates conifer seedlings, and that it may decrease biodiversity for many years in ponderosa pine forests.



*A 1957 soil laboratory on the Calhoun Experimental Forest in South Carolina.* Photo by Lino Dell-Bianca

### Genetically Engineered Gypsy Moth Virus

The gypsy moth, *Lymartria dispar*, continues to be a serious insect pest of hardwood forests in the East, and is spreading into the Southeast and Midwest. Compared to most chemical and biological agents used for gypsy moth control, a virus, coded LdNPV, has the advantage of causing no adverse environmental harm. However, LdNPV is not competitive in cost or performance compared to other gypsy moth control agents. Researchers at the Northeastern Station's Forestry Sciences Laboratory in Delaware, Ohio, are using the tools of biotechnology to enhance the potency and control effectiveness of LdNPV.

Finding: A genetic variant of LdNPV was engineered to contain a gene from a common bacterium found in human waste, *E. coli* (the beta-galactosidase gene). This foreign "marker" gene is needed to construct viral strains with enhanced gypsy moth control properties. The marker gene allows identification of the genetically engineered virus using a colorimetric assay. The marker/LdNPV will be used to develop optimum ways to create new LdNPV strains with enhanced biocontrol characteristics. LdNPV is specific for the gypsy moth and has no adverse impact on other fauna and flora.

### Controlling Bark Beetles

Bark beetles throughout the West are killing millions of trees weakened by drought and other factors. This uncontrolled mortality can severely affect forest health, wildlife habitat, and recreational values. Few options exist for responding to these situations other than salvage harvesting of dead timber. Bark beetles primarily use two types of pheromones to communicate with each other: aggregation and antiaggregation pheromones. Aggregation pheromones attract large numbers of beetles to an individual tree, which overcomes the tree's natural defenses. Antiaggregation pheromones interrupt or neutralize the aggregation pheromone and signal other beetles that the trees are already infested, causing them to go elsewhere. In a cooperative research effort between the Northwest Forest and Range Experiment Station and the National Forest System's Alaska Region, a new spruce beetle, *Dendroctonus rufipennis*, aggregation pheromone component with strong powers for attracting the beetles, was successfully tested as a means of monitoring the seriousness of infestations.

*Viral plaques being analyzed to identify the genetically engineered gypsy moth nuclear polyhedrosis virus containing the beta-galactosidase "marker" gene.* Photo by James Slavicek

Finding: The addition of methylcyclohexenol (MCOL) to a spruce beetle sex pheromone blend resulted in a 500-percent increase in the number of adult spruce beetles caught in traps used to monitor populations. This new blend will be an effective tool for resource managers to use in manipulating populations of spruce beetles. This research was part of a larger international project that included cooperation with Forestry Canada, the University of Calgary, Simon Fraser University, and Phero Tech, Inc.

Researchers from the Pacific Southwest and Pacific Northwest Forest Experiment Stations, in cooperation with private industry, demonstrated for the first time that damage caused by mountain pine beetle, *Dendroctonus ponderosae*, can be managed by the aerial application of pheromones.

Finding: Pretreatment sampling showed nearly identical levels of infestation present on both treated and untreated plots. Posttreatment sampling found that the level of infestation on the untreated areas was four times higher than on the treated areas.

*Research entomologist at Pacific Northwest Station is shown collecting adult spruce beetles for a Lindgren funnel trap baited with a new spruce beetle sex pheromone.* Photo by Pat Werner

### Southern Pine Beetle Populations

A common belief is that southern pine beetle (SPB), *Dendroctonus frontalis*, outbreaks are caused by variations in climate.

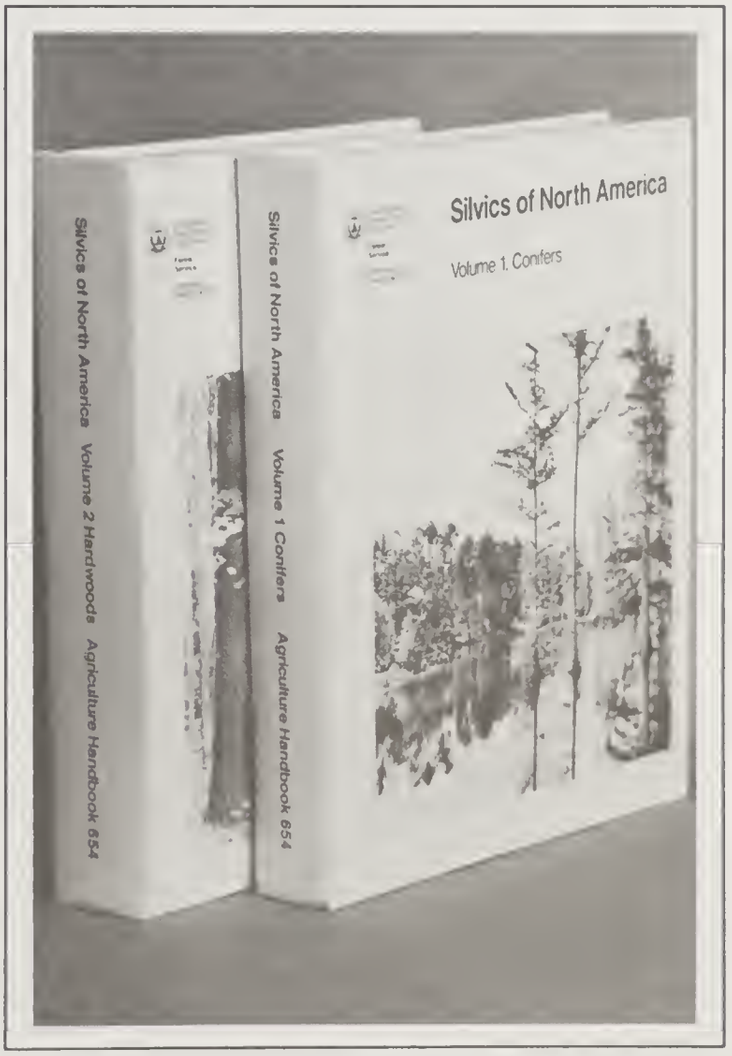
Finding: Analysis of SPB activity in east Texas by Southern Forest Experiment Station researchers, in cooperation with the Texas Forest Service, showed that changes in population size were driven not by random fluctuations of weather but by mechanisms that are dependent on population density, and that they reach a peak about every 8 years.

Some of the commonly used methods for suppressing SPB infestations are based on manipulating beetle movements. Southern Station researchers measured SPB flight dispersal by releasing beetles marked with fluorescent dust and recapturing them in traps.

Finding: The median dispersal distance was estimated at 0.7 km. This result suggests that when infestations are controlled by traditional means, such as cut and leave, or by novel methods such as treatment with antiaggregation pheromones, beetles from such infestations can disperse widely.

### Silvics of North America

Silvics information is essential in the management of the Nation's forests to understand how the forests develop and grow and to ensure that the vigor and health of these forests are maintained and protected. Silvics is the study of the life history and general ecological characteristics of forest trees and stands. To provide current needed information in a useful form, Forest Service silviculture specialists, ecologists, practicing foresters, and their university counterparts were recruited to prepare state-of-knowledge reviews on the silvics of 63 tree species and 20 varieties of conifers, and 128 species and six varieties of hardwoods—both native and introduced to the United States plus a few growing in the Commonwealth of Puerto Rico. About 200 scientists worked on this task over a 12-year period.




*"Silvics of North America," a two-volume update on how forests develop and grow.* Photo by Ken Hammond

Status: In FY 1991, the final review was released; it consists of two volumes, totaling 1,552 pages. These volumes contain the current silvical information on virtually all of the commercially important forest trees of the United States and Canada as well as on some of those growing in Mexico and the Caribbean islands. This summary of the silvics of North American forest trees is being distributed through forest experiment stations and regional offices and is for sale by the Superintendent of Documents.

### Visual Quality in Urban Forests

Using state-of-the-art technology with several research partners, North Central Station scientists developed a computer mapping approach to assess and display visual quality preferences related to development projects of forested urban hillsides in Cincinnati, Ohio. This program can be used by managers to incorporate public preferences for visual quality into their decisionmaking process and management strategies.

Finding: This research demonstrated how public preference information from a diverse coalition of governmental units and public and private organizations can be incorporated into protection policies and ordinances.

### Toxic Waste Cleanup

Environmental concern over the penetration of toxic chemicals into the soil and ground water has highlighted the need for better technology to clean up sites contaminated with toxic chemicals. Wood-decaying fungi can successfully degrade toxic polychlorinatediphenyols (PCP's) that have contaminated soil, according to recent research at the Forest Products Laboratory. The Forest Service research study was developed in cooperation with the Environmental Protection Agency, which has oversight of toxic site cleanup.

Finding: The study demonstrated the feasibility of using two species of white-rot fungi to reduce the soil concentration of

*Cincinnati's forested hillsides, sloping up from the Ohio River, are an important aesthetic resource for the city's residents.* Photo by Hillside Trust

PCP's by about 90 percent. The study site, located in Wisconsin, had PCP levels as high as 4,435 micrograms per gram in the soil around storage tanks of the toxic chemical. Despite cool temperatures which can slow down fungal activity, the fungi broke down most of the PCP's into nontoxic compounds. By controlling temperatures and moisture to favor fungal growth, the rate of depletion of PCP's can be enhanced.

### Biomechanical Pulping

Scientists at the Forest Products Laboratory, along with the University of Wisconsin and 15 pulp and paper-related companies, are exploring a new approach to wood pulping—biomechanical pulping. In this new process, wood chips are softened with white-rot wood-decay fungi. Then the wood chips are mechanically pulped. This research program is the first comprehensive evaluation of biomechanical pulping in the world.

Finding: Many of the experimental treatments have shown great potential for substantial energy savings in this new process. Potential also exists for improved paper strength properties and reduced impact on the environment. A patent, "Biomechanical Pulping of Southern Pine," was granted in April 1991.

*Researchers use an air-lift bio-reactor to treat sterile wood chips with white-rot fungi.* Photo by Jim Vargo

### Fire-Retardant-Treated Wood Products

Fire-retardant-treated (FRT) plywood has been used extensively as roof sheathing to provide a firebreak at the roofs in townhouses and apartments. However, significant structural problems have arisen with this product. Temperatures frequently found in roof structures tend to prematurely degrade FRT wood, which results in buckled roof panels and leaky roof systems. To determine if FRT plywood will perform adequately when left in a structure, inspection professionals needed a nondestructive test method to evaluate the strength of such products.

Finding: Researchers at the Forest Products Laboratory have developed a nondestructive test procedure to assess the residual strength of FRT products. Researchers designed a low-cost tool that combines a portable force-measuring device with a small fixture for gripping a screw inserted into the plywood. Simple screw withdrawal resistance provides an excellent assessment of the residual strength of the FRT plywood. Two equipment manufacturing firms (one in Michigan and one in Ohio) used these research results to develop devices to assess the structural integrity of FRT materials.

*Researcher demonstrates use of probe developed by Forest Products Laboratory researchers that allows building inspectors to determine the residual strength of fire-retardant-treated structural materials quickly and without damaging the structure.*
Photo by Steve Schmiedling

### Reducing Landfill Waste

Development of a technology that reduces landfill waste by producing products from solid waste is a high-priority research issue. Forest Service research has utilized landfill waste to produce wood/noncomposites. High-performance composite products that are potentially recyclable themselves are produced by recycling the wood fiber and some of the plastics from landfill wastes. Research at the Forest Products Laboratory used recycled office waste paper, shredded old newspapers, dry fiberized old newspaper, and fiberized waste wood.

Finding: The raw paper materials were mixed with polyester or polypropylene, and formed into a continuous, low-density mat of intertwined fibers. The low-density mat is the fibrous matrix which is melt-blended with phenolic resins to produce panels for interior car doors, truck liners, piano soundboards, and sheathing materials.

Forest Service research at the North Central Forest Experiment Station has also used inorganic materials, such as Portland cement, in combination with recycled wood fibers to produce lightweight concrete panel products.

Finding: A product called "Chunkrete" uses wood chunks, particles, or fibers to substitute for gravel aggregates in a concrete-like product. These lightweight panel products have unique advantages because they are resistant to fire and decay, are lightweight, and can be fastened with screws or nails. Some are water-resistant, making them suitable for exterior application.

### Strength of Structural Timber

The design values used by engineers and builders were established during the 1920's based on 2-inch by 2-inch clear specimens. Evidence indicated that these design values could be overestimating the strength of structural timber by as much as 25 to 30 percent.

In 1977, the major grading agencies in the United States asked the Forest Service to assist in evaluating the actual strength of structural lumber. Together with technical representatives of the lumber industry and faculty from several major universities, the Forest Products Laboratory developed the database to assign design values that were more representative of the current lumber resource. Some 43,500 pieces of lumber, graded by existing grading rules, were sampled from throughout the Nation and tested to create this database.

Finding: The results of this extensive program, known as the In-Grade Program, have been implemented through the development and acceptance of new and/or revised lumber standards. These include: 1) a new American Standards for Testing and Materials (ASTM) standard for testing the mechanical properties of wood (ASTM D4761), 2) a new standard for establishing the allowable properties of visually graded lumber based on tests of full-sized specimens (ASTM D1990), and 3) a significant revision of a standard for evaluating the properties of structural lumber (ASTM D2915).

In June 1991, the new allowable properties were approved for use by the American Lumber Standards Committee, bringing the results of the 14-year project into application.

*Researcher holds an office tray produced by injection-molding of plastic and recycled newspaper.* Photo by Steve Schmiedling

### Computer-Based Simulator for Furniture Industry

Northeastern Station scientists have shown that high-quality furniture and cabinet parts can be produced from lower quality hardwood lumber with gang-rip-first technology.

Finding: A computer-based simulator was developed to analyze several processing options associated with this technology. This will result in the extension of the hardwood resource, which comes primarily from the nonindustrial private woodlands. The development of higher value markets for the lower grade portion of hardwood lumber will ensure a more efficient use of the total resource.

*Researchers compare simulated gang-rip-first lumber processing results with an actual sample of hardwood factory lumber.*
Photo by David L. Sonderman

### One-Step Preservative/Fire Retardant

Wood products that are both resistant to decay and fire are not commercially available. However, Forest Service Research at the Forest Products Laboratory has developed a one-step combined preservative/fire-retardant system for use in exterior applications.

Finding: Field and laboratory studies show that the one-step combined preservative/fire-retardant system maintains efficacy against decay and fire after long-term exposures to field and weathering conditions. A U.S. patent has been filed on the system.

## RESEARCH TO RESPOND TO GLOBAL RESOURCE ISSUES

### Global Change Research Program

Many scientific models have predicted global changes that would impact timber harvests, wildlife habitat, recreational opportunities, and aesthetic values in the Nation's forests, but there are considerable discrepancies among these predictions.

Status: The Forest Service is conducting research to provide information that will assist in formulating policy and practice in the face of uncertainty about global change.

### Global Forest Biodiversity

The world's forests are rapidly being seriously modified and even destroyed because of clearing forests for agricultural use, conversion to roads, expanding human settlements, poor forestry practices, and the collection and cutting of fuelwood. A major concern is genetic impoverishment, including species extinction.

Status: Forest Service scientists are addressing these problems at the regional, national, and international levels. In the Lake States, research is underway on developing strategies for conserving and enhancing biodiversity as an integrated part of a land management process that sustains human activities such as recreation, timber harvesting, wildlife, and food production.

Nationally, the Center for Conservation of Genetic Diversity, established by the Forest Service in California in 1990, continues research to provide the tools for wildland management that fosters forest diversity and vigor. Recommendations resulting from research integrating biodiversity conservation into land management activities are being implemented on at least four national forests in California.

### Global Forest Genetic Resources

The scale of all human development is unprecedented, and is destroying priceless forest genetic resources. A Southeastern Station scientist assisted the National Research Council in development of a book on the management of the world's forest tree genetic resources.

Finding: The book describes the results of an international survey of seed and stand conservation programs and a literature survey of technologies available for conservation programs.

### Forests in a "Greenhouse" Climate

How will future forests respond to expected increases in carbon dioxide in the atmosphere, and the associated global warming? Predicting such forest changes requires a process-oriented approach in which computer simulation models integrate environmentally sensitive processes and feedbacks, and describe how ecosystems function.

Finding: A visiting scientist from Bulgaria, working at the Rocky Mountain Station in Colorado, developed a unique model that relates the basic forest canopy processes of photosynthesis and transpiration to tree growth, competition, and succession. This new model is expected to be a major tool in predicting impacts of changing climate on forests in the Rocky Mountains and in Europe.

*This tropical forest has been cleared for a gold mining operation in Brazil.* Photo by Calvin Sperling

**Cooperative Fire Research**

Status: A collaborative U.S./Brazil fire initiative was established to assess the effect and extent of fires within the tropical savannahs and forests of Brazil and to assist in the development of a system for fire management. The program will also develop a means to reduce the adverse ecological impacts and emissions of radiation-absorbing trace gases and smoke particles from extensive wildland fires.

**Natural Disasters and the Wildland/Urban Interface**

Natural disasters such as wildfires, floods, windstorms, earthquakes, and landslides wreak havoc on human environments and natural resources. At the wildland/urban interface, fires often consume forests and homes.

Status: Forest Service Research is an active member of the Federal Interagency Subcommittee on Natural Disasters, where its expertise in fire and natural resource management is helping to shape the U.S. program for the International Decade for Natural Disaster Reduction.

Finding: In FY 1991, a report titled "Hazard-proofing the Nation, a Strategy to Reduce Natural Disaster" was developed for the Office of the President's Science Advisor and the Federal Coordinating Council for Science, Engineering, and Technology.

**Productivity of Secondary Tropical Forests**

The productive potential of secondary tropical forests is of global concern. Secondary tropical forests now make up about one-half of the forests in the tropics and will soon be the only remaining source of natural timber in these regions of the world. The Southern Forest Experiment Station's Institute of Tropical Forestry and the Station's Forest Inventory and Analysis (FIA) Project conducted a followup inventory and assessment of a 1980 inventory in Puerto Rico.

Finding: The followup inventory showed that for a 5-year period, 134 ground locations had a combined increase in forested area of 11 percent. The increase in total timber volume during the same 5 years was nearly 36 percent, demonstrating that secondary forests are productive.

### Tree Stand Responses to Environmental Changes

Status: Southeastern Station scientists developed a mathematical model that relates plant growth in forest stands to environmental conditions. The model is based on stand-level physiological processes and provides a method for assessing the effects of changes such as altered climate or carbon dioxide concentration on forest productivity. It also helps explain why the probable changes will occur.

### Pacific Rim Log Trade

Economists at the Pacific Northwest Forest and Range Experiment Station recently published an analysis of softwood log trade for the Pacific Rim.

*Stem respiration measured with an infrared gas analyzer at the Coweeta Hydrologic Laboratory in southwestern North Carolina.* Photo by James M. Vose

Finding: The study revealed a tight linkage between economic changes in the United States and those in Japan. The general economies of the two countries move together, within a month or two of each other. Thus, demands for U.S. and Japanese wood products generally move together. Further, the study found that in the late 1980's, the rate of increase of total Pacific Basin softwood log movements lessened. However, the overall trend continues upward. Also, average log prices have increased much faster than inflation.

### Heating Lumber Kills Nematodes

Pine wood nematodes can cause a serious wilt disease of some pines under certain conditions. For example, in Japan, where the nematode was introduced from the United States, severe mortality occurs. Although the nematode is native to North America, it does not significantly harm U.S. forests. To protect their forests from this nematode threat, members of the European Economic Community (EEC) are considering a requirement for kiln-drying all softwood lumber imported from North America to prevent the possible introduction of the nematode into their forests.

Finding: Results of research in FY 1991 at the Southeastern Forest Experiment Station show that kiln-drying southern pine lumber is not necessary. A brief heat treatment to a high temperature (60 degrees C) will kill the nematode.

*Drilling for nematodes—tiny creatures often found in North American lumber.* Photo by L. David Dwinell

### International Cooperation on Gypsy Moth

Dr. William Wallner, a gypsy moth scientist with the Northeastern Experiment Station, has spent several months over the last few years working with Russian scientists in Siberia. During this time, Dr. Wallner became familiar with the Asian strain of the gypsy moth. Recently, this Asian strain of the gypsy moth was introduced into Oregon, Washington, and British Columbia.

Status: Dr. Wallner's first-hand knowledge of the Asian strain of the gypsy moth has proved invaluable to both Canadian and U.S. plant pest regulatory agencies as they try to assess the situation and plan for eradication. This knowledge also provides the Forest Service with a significant headstart in its research program on this insect.

### Energy Savings From Windbreaks

Forest Service studies as long ago as the 1930's showed that windbreaks save energy for heating buildings. However, it has been difficult to consider all the energy flows in a building over the course of a year when studying the effects of windbreaks in different arrangements.

Finding: Researchers at the Northeastern Station have developed a method to use a commercially available building energy-analysis computer program to simulate the effects of windbreaks on energy use. This method will be used to study optimum tree species and planting arrangements in different climates and with different kinds of buildings to provide recommendations to landscape architects, urban foresters, and extension personnel.

*A personal computer was used to simulate the effects of tree windbreaks on energy use in a single-family home for a range of climates. Forestry technician uses a graphics program to prepare a plan-view illustration of the house and windbreak.* Photo by Gordon Heisler

*Yellow poplar plywood sheet made by Forest Products Laboratory in 1913.* F.S. Photo

*In 1918, the Forest Products Laboratory in Madison, Wisconsin, was requested to design wooden propellors for World War I fighter airplanes.* F.S Photo


*An administrative center (circa 1910) within the Columbia (now Gifford Pinchot) National Forest in Washington.* F.S. Photo

## Chapter 6

# Administration

*Providing Customer Service in a Quality Manner*

Photo by Jill Bauermeister

## INTRODUCTION

Forest Service Administration program objectives are to facilitate the smooth and efficient operation of the Forest Service organization. This role includes the following functions: fiscal and public safety, property and procurement, information systems, computer sciences and telecommunications, public affairs, and service programs in personnel, civil rights, and the human resources programs.

Administrative programs are integrated with all other agency programs. Special-emphasis items in FY 1991 included issuance of the two reports: "Toward a Multicultural Organization," which set agency goals and strategies for improving ethnic, cultural, and gender diversity, and "Improving Communications and Working Relationships," which studied our current programs and recommended ways to improve our effectiveness. A third emphasis area concerned "Accountability and Excellence in Financial Management," with a pilot program developed to further integrate the agency's administrative processes.

## IMPROVING AGENCY PRODUCTIVITY

### Department of Agriculture Demonstration Project

During FY 1991, the Forest Service hired approximately 1,000 new employees through this experimental employment authority. A measure of this project's success is the low turnover rate. Only 21 of the Demonstration Project's appointments over the past 15 months have separated from the agency, far fewer than experienced with traditional appointment authorities. A third-party evaluation, conducted by Pennsylvania State University, states that this alternative hiring method also saves time, money, and effort—and leads to quality selections.

### Total Quality Management

This management initiative is aimed at improving the quality of the products the Forest Service produces. Initial training was conducted in the Washington Office and in many field units. Total quality management is changing the way the Forest Service perceives its customers and its products.

*In 1921, large maps were made by painstakingly painting them, such as this map of the San Isabel National Forest in Colorado.*
F S. Photo

*Computer technology allows foresters on the George Washington National Forest in Virginia to map with remote sensing equipment and transfer the information quickly to a Geographic Information System (GIS) mapping system.* Photo by Yuen-Gi Yee

## MANAGING THE HUMAN RESOURCE

### Forest Service Work Force

The Forest Service's permanent work force increased by 1,080 over the past year, and now totals 34,861. The primary growth areas were in the wildlife and recreation staff areas. Table 58 displays the number of paid employees by occupational category for selected fiscal years, and table 59 displays the number of paid employees by type of appointment for selected fiscal years.

### Work Force Diversity

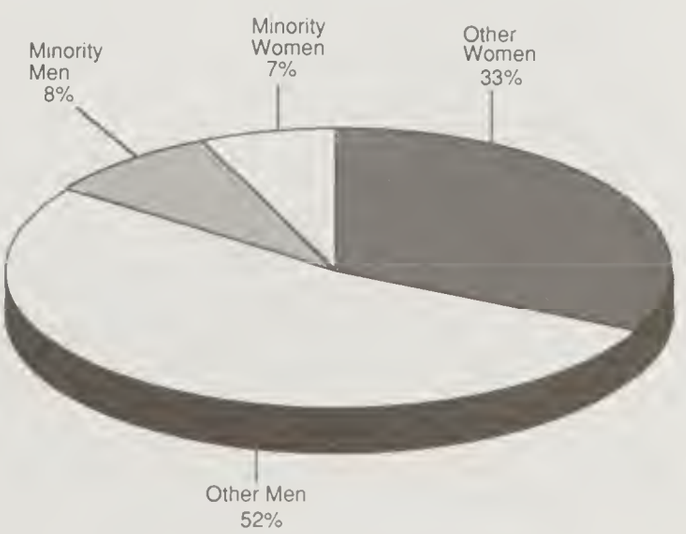
The Forest Service desires a work force that is similar to the civilian labor force with respect to gender, race, national origin, and disabled status. See figure 51 for the FY 1991 permanent non-Federal composition by gender and minority status.

Table 60 shows the number and percentage of permanent and excepted-conditional employees by race/national origin and gender. Over the fiscal year, the number of women increased by 653; women now comprise 39 percent of the permanent/excepted work force. The number of minority employees increased by 297 and now represents 15 percent of the permanent/excepted work force. These gains in women and minority employees occurred in most occupations and grades.

In addition, the Forest Service made significant progress in employing disabled employees. During FY 1991, the percentage of disabled employees increased from 4.32 to 4.50 percent of the work force. For the more severe "targeted disabilities," representation increased from 0.83 to 0.89 percent.

Figure 51.

**FY 1991 Forest Service Permanent Work Force Composition**



### Toward a Multicultural Organization

In January 1991, the leadership of the Forest Service unanimously endorsed the goals and strategies recommended by its national Work Force Diversity Task Force. The commitment is to move the Forest Service further toward becoming a multicultural and diverse organization. The Work Force Diversity Task Force's report, "Toward a Multicultural Organization," serves as the blueprint for action. A National Implementation Plan has been developed, identifying six national focus areas. These focus areas link the goals and strategies from the task force report to provide for logical and efficient implementation.

### Historically Black Colleges and Universities Program

In FY 1991, the Forest Service increased the amount of research grants, the number of summer and cooperative education students, and the number of new hires from historically black colleges and universities. Through the summer employment program, the Forest Service employed 207 summer students from historically black colleges and universities.

*A forestry student at Alabama A&M University shows one of his research projects to Charles Hilty, Assistant Secretary of Agriculture.*
Photo by Jill Bauermeister

### Native American Employment Program

The Forest Service maintained two liaison positions for Native Americans—one at Haskell Indian Junior College, which is an intertribal school in Lawrence, Kansas, and the other at Fort Collins, Colorado. These efforts increased the number of Native American summer and cooperative education students, and the program is increasing interest in natural resource careers among American Indians.

Comparing FY 1991 with FY 1990 shows a 67-percent increase in summer students (55 students) and a 200-percent increase in new cooperative education students from Haskell College. Service-wide, over the past year, over 100 Native Americans or Alaskan Natives were placed into permanent Forest Service positions.

### Labor Relations

The Forest Service hosted a transitional meeting for newly elected National Federation of Federal Employee (NFFE) regional vice-presidents and their field management counterparts to enhance labor relations. The Forest Service also held joint training sessions to build understanding and teamwork.

### Human Resource Programs

Human resource programs provide job opportunities and training for youths, the unemployed, underemployed, economically disadvantaged, people with disabilities, and elderly, while carrying out high-priority conservation work. During FY 1991, these programs offered employment and skills training to 134,620 persons, including many women and minorities. For an investment of $89.5 million, $114.4 million in accomplishments were returned from all programs (table 61). The participants constructed campgrounds, trails, office buildings, warehouses, fences, and roads; planted trees; fought fires; improved timber stands; and provided clerical support.

### Job Corps

Under an agreement with the Department of Labor, the Forest Service continues to operate 18 Job Corps Civilian Conservation centers on 15 national forests in 11 States. The aim of the centers is to improve the enrollees' job qualifications for productive work through training in vocational skills, basic education, and social development. Presently, 13 centers are coeducational. The remaining five centers will become coeducational over the next 2 years.

In FY 1991, the Forest Service entered into an agreement with Alabama A&M, a member of the Historically Black College and University group, to combine hands-on forestry training at the Schenck Job Corps Center in North Carolina with academic training at Alabama A&M University. This effort should prepare those Job Corps enrollees completing the program for jobs in natural resource disciplines.

*A group of Civilian Conservation Corps (CCC) members plant seedlings during the 1930's.* F.S. Photo

Eighty-six percent of the graduates of the 18 Forest Service Civilian Conservation centers were placed in jobs, entered college or advanced training courses, returned to school, or joined the military. The centers trained 9,139 students between the ages of 16 and 22 and accomplished $20.7 million in improvements, including community work, building construction, wildfire control, and forestry activities.

**Senior Community Service Employment Program**

The program provides part-time community service employment for low-income persons age 55 or older, together with training to upgrade present skills and to introduce new skills. In FY 1991, 15 percent of the participants were placed in unsubsidized private or public positions. A total of 5,730 participants produced $37.6 million worth of conservation work, for a $1.58 return per dollar of Federal cost.

The theme of the national conference held to celebrate the Silver Anniversary of the Senior Community Service Employment Program (SCSEP) was "25 Years and Still Working for America's Future." The conference, held in January in New Orleans, LA, was a tribute to all who have made the SCSEP one of the greatest social service programs sponsored by the Government. Over 1,300 individuals (including approximately 135 Forest Service personnel) from around the country came to celebrate a common history and purpose by participating in workshops and programs intended to strengthen their individual as well as group talents.

Over the Forest Service's 20-year history with the program, the agency has provided employment and training opportunities for over 60,000 older Americans. The enrollees have contributed over $300 million in work accomplishments to the National Forest System.

**Volunteers on the National Forest System**

The Volunteers Program provides assistance in natural resource protection and management programs at nominal cost. The program offers individuals and sponsored groups/organizations the opportunity to donate their talents and services to help manage the Nation's natural resources. During FY 1991, 94,585 volunteers assisted in the management of the National Forest System; they contributed 2,186 person-years of work valued at $33.8 million. Volunteers participate in resource protection and management, cooperative forestry, and research. Typical positions include campground hosts; information specialists; fire lookouts; and recreation, wildlife, and fisheries assistants.

*A local Boy Scout troop collects trash on the Angelina National Forest, Texas, during the "Great American Trash-off."*
Photo by Gay Ippolito

The Chief's Volunteer National Awards Program annually recognizes volunteers and employees. During National Volunteers Week, many volunteer service awards were presented to individuals, sponsors, and Forest Service employees and units.

The Touch America Project (TAP), a component of the Volunteer Program, provides greater opportunities for youths, ages 14-17, to gain work experience and environmental awareness while working on public lands. In FY 1991, private sector organizations sponsored 3,311 youths in TAP. Projects included maintaining and building trails and constructing recreation areas.

### Youth Conservation Corps

The Corps provides 8 weeks of summer employment for 15- through 18-year-olds from all strata of society. Youths earn and learn while performing conservation work on the National Forest System. The enrollees are paid from Forest Service funds. In FY 1991, the 1,230 enrollees' work returned $1.88 for each dollar of cost.

*Youth Conservation Corps (YCC) learn how to net fish for a stream survey on the Monogahela National Forest in West Virginia.*
F.S. Photo

### Hosted Programs

Hosted programs provide conservation training and work opportunities on the National Forest System or in conjunction with Federal programs. Programs are administered through agreements with State and county agencies, colleges, universities, American Indian Tribes, and private and nonprofit organizations, with multiple objectives such as disabled rehabilitation, and advocacy for elderly or at-risk youth. Most workers represent little or no direct cost to the Forest Service since funds are supplied by State health and welfare agencies, the Job Training Partnership Act, State block grants, vocational rehabilitation offices, college work study programs, and other means.

*A campground visitor talks about nearby recreation activities with a campground "host," a mentally impaired youth who volunteers each summer on the Medicine Bow National Forest in Wyoming.*
Photo by Ed Fox

In FY 1991, the 23,936 participants contributed work to National Forest System programs valued at $18.9 million. Due to the multicultural diversity of participants gaining experience in these programs, the Forest Service is provided a potential pool of employees who reflect our Nation's strength—its diversity.

The Department of Justice, Federal Bureau of Prisons, and the Forest Service signed a national interagency agreement on June 13, 1991. This cooperative agreement allows minimum security inmates to work on the National Forest System. Currently, programs are operating successfully on the Allegheny National Forest, Pennsylvania (R-9); the Siuslaw National Forest, Oregon (R-6); and the Superior National Forest, Minnesota (R-9).

### Keep America Beautiful, Inc.

Keep America Beautiful is a nonprofit, public education organization dedicated to improving waste handling practices in American communities. Keep America Beautiful's Public Land Stewardship Program involves volunteers in cleaning and maintaining public lands and resources. The Public Lands Day (Federal Lands Cleanup Day) is observed annually.

## MANAGING THE CAPITAL RESOURCES

### Receipts and Expenditures

Although the Forest Service receives funds from Congress and other sources, it also produces revenue. In FY 1991, the Forest Service produced 42 cents of revenue for every dollar expended. Total receipts were $1.44 billion, and total expenditures were $3.42 billion (figure 52, tables 62-66). Receipts were collected primarily from timber sales, mineral leases and permits, grazing fees, and recreation uses. Figure 53 displays the distribution of receipts by program area. Table 67 displays a summary statement of resource values and obligations, with a net benefit of $9.16 billion.

Figure 53.
**Forest Service Receipts by Program**

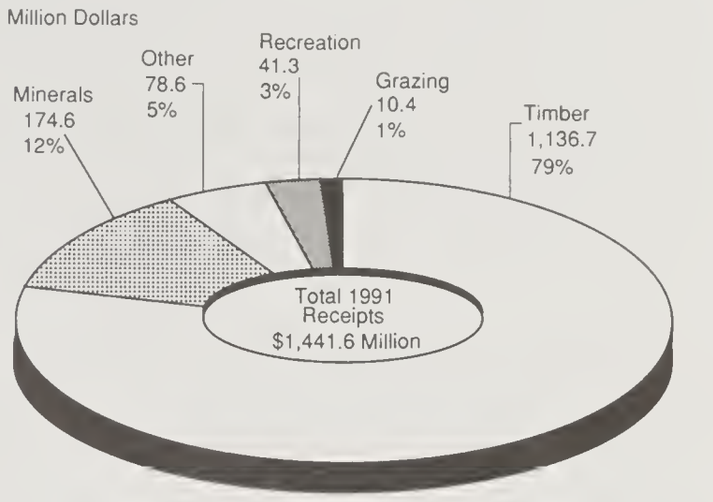
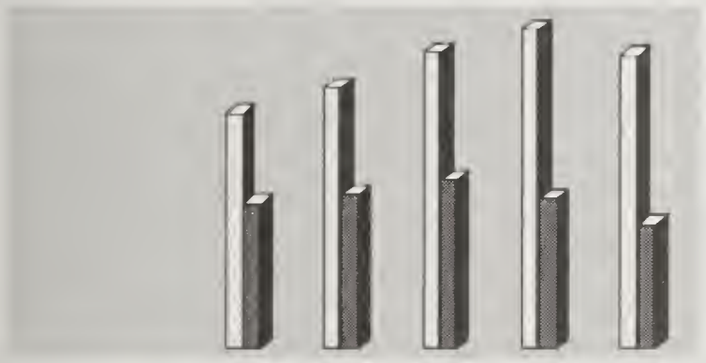



Figure 52.
**Forest Service Expenditures and Receipts**



| Fiscal Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| | (Million 1991 Dollars) | | | | |
| Expenditures | 2,744 | 3,035 | 3,453 | 3,719 | 3,418 |
| Receipts | 1,701 | 1,823 | 1,987 | 1,755 | 1,442 |
| Receipts as Percentage of Expenditures | 62 | 60 | 57 | 47 | 42 |

### Procurement and Property

In FY 1991, the Forest Service spent approximately $650 million on more than 5,115 new contracts and 150,000 small purchase procurements. Eighty-eight percent of the total procurement dollars went to small businesses. Contract awards included more than $35 million to businesses owned by socially or economically disadvantaged individuals and $19 million to female-owned firms.

The Forest Service also continued to expand its outreach program, discussing procurement opportunities at national minority conferences. The agency implemented use of the small purchase credit card and continued to participate in the pilot testing of third-party drafts.

During FY 1991, Forest Service emphasis was directed at accomplishing work through partnerships. This was facilitated by developing simplified methods, guidelines, and agency "rules of thumb" concerning planning for effective partnerships. FY 1991 appropriation language allowed the Forest Service to continue entering into noncompetitive challenge cost-share arrangements where the cost-share partner performs the work. Legislative language has been developed to transfer the challenge cost-share program from recurrent appropriations act(s) into a permanent statute.

The Forest Service manages approximately 26 million square feet of space, including buildings it owns and leases and space controlled by the General Services Administration. The Forest Service acquired, used, and disposed of personal property worth more than $700 million, including property on loan to State forestry departments. The agency also managed approximately 5,000 units as living quarters for Forest Service employees—more than any other civilian agency.

The emphasis on recycling increased, as all offices were directed to collect and recycle high-grade waste paper. The Forest Service is also encouraging all forest units to use recycled paper.

## MANAGING THE INFORMATION RESOURCE

The Forest Service continued a strong emphasis on managing information as a valuable resource that must be managed to obtain its maximum value.

The Forest Service's objective is to make information easy to access and share. Several principles guide the steps to achieve this objective in the 1990's, requiring information to be:

- Integrated—information collected and stored to serve many uses.
- Readily available—information available to those who need it.
- Managed close to its origin—information managed as close as possible to the location where it is collected by those who know it best.

In FY 1991, through the following major accomplishments, the Forest Service moved closer to having an integrated information environment:

- Developing and publishing a document titled, "A Vision of Information Resources Management."
- Initiating a proposal to develop a Forest Service Strategic Information Resource Management (IRM) Plan for the 1990's. An executive-level team was chartered to lead the planning effort. The plan will include recommendations on all aspects of IRM—information systems, business processes, organizational roles, and responsibilities—as well as link an overall information strategy to other related issues.
- Commencing the "People Database Project" for the purpose of integrating and sharing people-related information. An Integrated Personnel System, a Fire Qualifications System, and other applications are being designed and prototyped to maintain and use this shared data.
- Establishing a database naming standards/conventions for Servicewide use for tables, columns, etc., for the purpose of simplicity, reduced chances for redundancies, and improved understanding.
- Supplementing the capability to send FAX and TELEX via X.400 from the Forest Service office support system.
- Completing the first phase of the Directives Automation Project. Electronic issuance of all Forest Service Manual and Handbook Interim Directives began in the spring of 1990, followed by the

*State-of-the-art communication in 1910 involved strategically placed telephone lines. This national forest ranger uses a line in Heber Canyon, Utah.* F.S. Photo

establishment of the Directives System Information Center Services, Servicewide. Special directives retrieval system software was also developed and released for Servicewide use in May 1991.

- Producing feasibility and cost/benefit analyses and studies for the procurement of Geographic Information System capability.

## KEEPING PEOPLE INFORMED AND INVOLVED

In order to improve its management of the National Forest System, the Forest Service sought the public's involvement on a number of issues and reviews.

### Improving Communications

In FY 1991, the Forest Service continued its emphasis on improving communications by taking several actions to implement the recommendation of the task force on Forest Service communications. The task force recommended five basic strategies to improve communications and working relationships: 1) Ensure that every employee has a clear understanding of the Forest Service mission, strategy, and vision, and that the employee uses this information in day-to-day work and is able to adequately describe it to the public; 2) Improve teamwork and cooperation based on open two-way communications, timely sharing of accurate information, and recognition of top communicators; 3) Recognize out-Service communications as a valuable part of the overall effort because such recognition is the foundation for building trust and supportive working relationships; 4) Develop and utilize skilled public affairs professionals to meet the need for timely and relevant information, to build strong working relationships, and to support the Forest Service mission; and 5) Focus and integrate communications and public affairs into the decisionmaking process at all levels.

### Public Involvement

The Forest Service is in the process of conducting a comprehensive review and evaluation of the National Forest System forest planning regulation. As part of that process, an Advance Notice of Proposed Rulemaking was issued in the Federal Register on February 15, 1991, with a request for public comment on the preliminary regulatory text. Four informational meetings were conducted. Some 630 responses were received, analyzed, and then considered in the formulation of a proposed rule. The agency is now preparing to analyze public comments on the proposed rule, after which a final rule will be developed.

*The Beartree Project, to improve grizzly bear habitat, demonstrates New Perspectives management through environmentally sensitive logging on the Lewis and Clark National Forest in Montana.* Photo by Jill Bauermeister

In another major review, the Forest Service revised the policy and procedures for implementing the National Environmental Policy Act (NEPA). The proposed revisions were published in the Federal Register on April 29, 1991, with a request for public comment. About 260 responses were received, analyzed, and then taken into account in the rewriting of the the Forest Service Manual, Chapter 1950, Environmental Policy and Procedures, and the Forest Service Handbook 1919.15, Environmental Policy and Procedures. A brochure explaining the revised guidance is being developed.

### Emphasis Areas

In FY 1991, the Forest Service continued to emphasize the development and implementation of communication plans to achieve its goals in several areas:

- New Perspectives, a program aimed at managing the National Forest System for a broader range of uses in a sustainable and more environmentally sensitive way.
- Challenge cost-share partnerships, volunteering, and other cooperative arrangements.
- Accessibility for all visitors and users of the National Forest System and its facilities.
- Threatened and endangered species, particularly the northern spotted owl, the red-cockaded woodpecker, and the Mount Graham red squirrel.
- Research findings and technology transfer, in such areas as global change and forest decline, the effect of global conditions on future research, tree nursery management and seedling propagation, forest fire management, black bear research, and extraction of taxol from the Pacific yew tree. Taxol is used in the treatment of various ovarian cancers and is used experimentally in other types of cancer treatments.
- Change on the Range, a program to improve rangeland quality, especially riparian areas.

### Media Access—Outdoor Writers' Convention

Packets of information on Forest Service programs were sent to each member of the Outdoor Writers' Association. More than 1,000 writers attended the annual conference in Niagara Falls, New York. Forest Service staffs worked to increase interest in the National Forest System and to enhance understanding of management issues through exhibits, speeches, and conversation.

### Popular Services

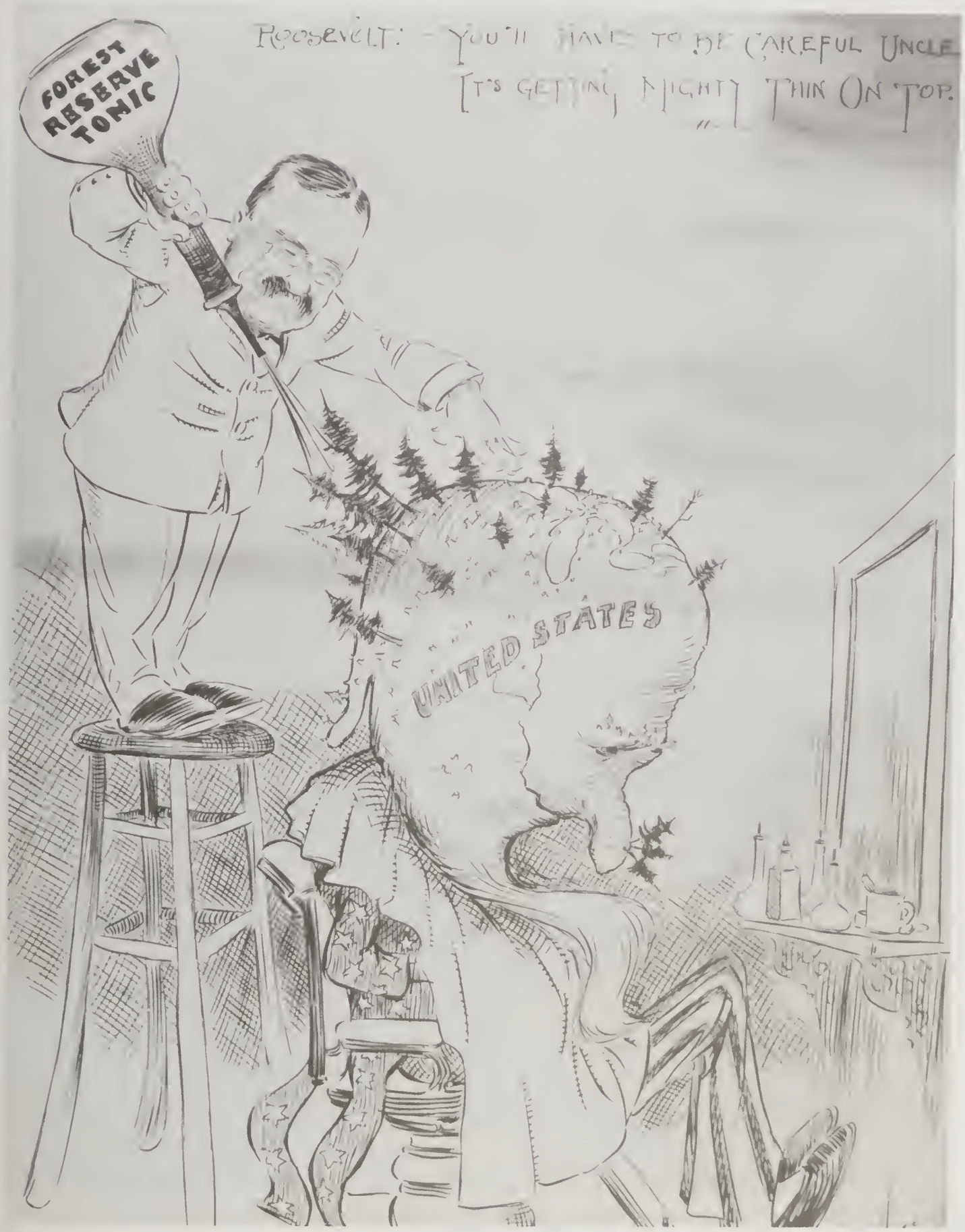
**Hotline for Fall Color News.** The Fall Color Hotline, a recorded telephone service, has been popular ever since it was instituted in 1988. During FY 1991, approximately 2,000 people called for information (updated weekly) about fall foliage in various parts of the country and the routes to national forest viewing areas. Television, radio, and print media called about 20 times per week at the height of the season.

*A "fall color" information campaign helped thousands of visitors find peak autumn color on the George Washington National Forest in Virginia.* Photo by Yuen-Gi Yee

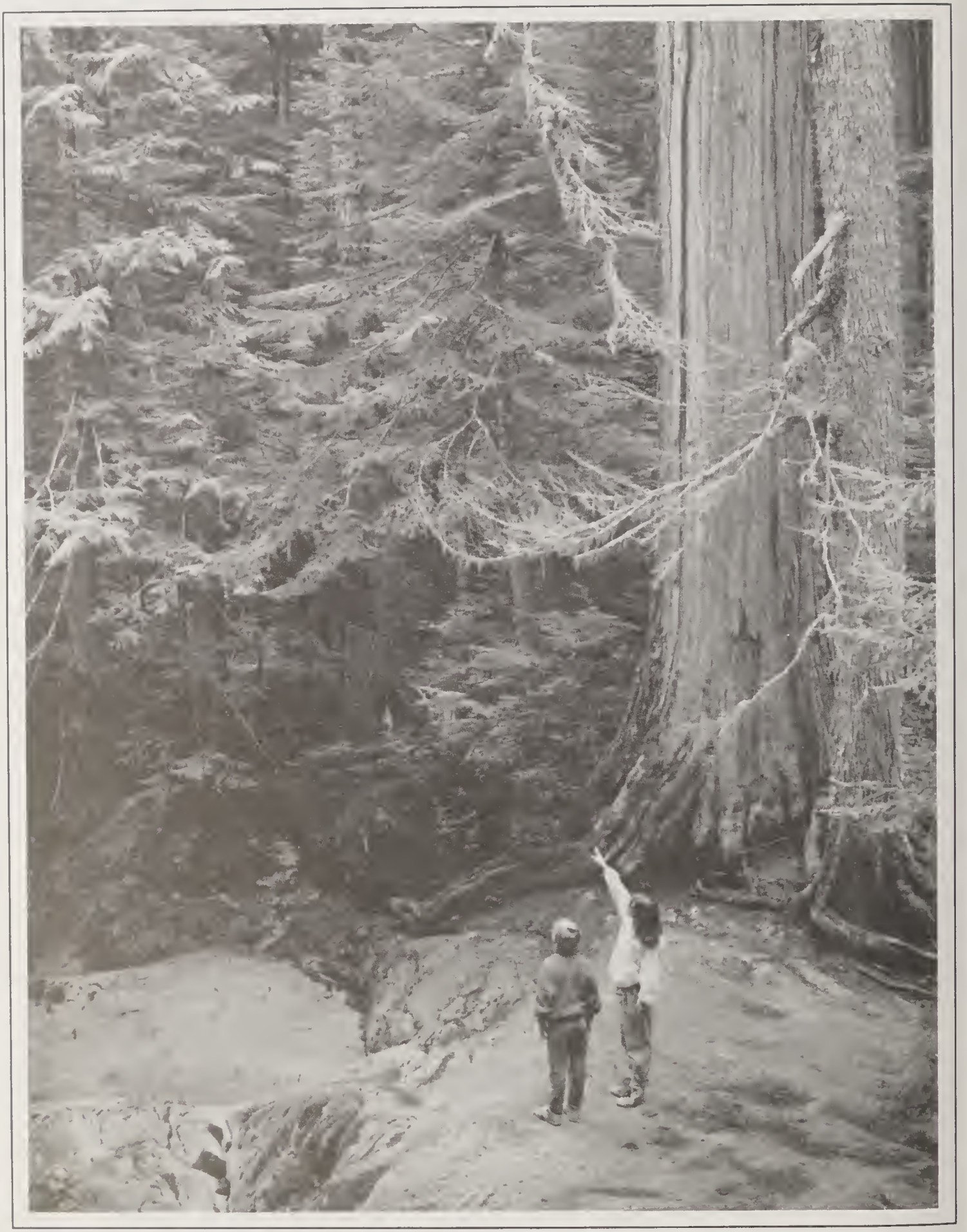
**The Capitol Christmas Tree**. Since 1959, trees from the national forests have brought holiday spirit to the United States Capitol grounds. The 1990 Christmas tree, a 65-foot Colorado blue spruce, came from the Routt National Forest and Walden, Colorado, in celebration of the centennial of that community's founding. Costs of felling, packaging, transporting, and decorating the tree were paid from community contributions.

**Research Service**. Program analysts in the Public Affairs Office monitored public attitudes concerning the environment, natural resource issues, the unique needs of special populations, and the work force concerns of minorities and women. Summaries of public attitudes were distributed to managers for their use in planning and evaluating the existing and proposed programs of the Forest Service.

**Audio-Visual Service**. Audio-visual materials on Forest Service management activities are available to the public at cost. These include photographs, slides, films, and videotapes.




*J.N. Ding cartoon, courtesy of the National Archives.*



*Sightseers in the Olympic National Forest, Washington.* Photo by Cary Given

# Glossary of Terms

**Accessible**: Describes a site, building, program, or service that can be approached, entered, and used by a person with a mobility, sensory, or cognitive disability.

**Accessibility**: The property of a site, building, program, or service that allows it to be approached, entered, and used by a person with a mobility, sensory, or cognitive disability. Accessibility is often used to describe the concept of improving design standards for sites, buildings, programs, and services to make them useable by persons with mobility, sensory, or cognitive disabilities.

**Anadromous fish**: Fish species, including salmon, steelhead, and sea-run cutthroat trout, that migrate from the sea up freshwater rivers and streams to spawn.

**AUM (animal unit month)**: The amount of forage needed to support a mature 1,000-pound cow or its equivalent for one month (also see Head Month).

***Bacillus thuringiensis***: Scientific name of a bacterium that is pathogenic to the larval stage of many lepidopterous insects (moths and butterflies).

***B.t.***: Abbreviation for *Bacillus thuringiensis*, a bacterial insecticide.

**Biological diversity**: See Diversity.

**Buffering capacity**: The ability of a lake to withstand changes in the pH (measure of acidity) of its water from acid deposition or other sources of acid or alkaline substances. (The larger the buffering capacity, the lower the sensitivity to changes in pH.)

**Class I airshed**: Part of a classification system defined in the Clean Air Act of 1977 denoting the increment above which deterioration of air quality is regarded as significant and not allowed to occur. Class I allows the least deterioration. Congress has designated 88 wilderness areas on the National Forest System as Class I airsheds.

**Dimilin**: An insecticide that acts as a growth regulator and prevents gypsy moths from completing development.

**Diversity**: The distribution and abundance of plant and animal communities and species.

**Douglas-fir tussock moth**: A foliage-feeding native insect, *Orgyia pseudotsugata*, of the western United States. It feeds generally on Douglas-fir and true firs.

**Ecosystem**: A complete interacting system of organisms and their environment.

**Endangered species**: As defined under the Endangered Species Act (1973), a federally listed plant and animal species in danger of extinction throughout all or a significant portion of its range.

**Fire severity index:** A measurable factor—such as precipitation, fuel moisture, and spring snowpacks—expressed as a percent of normal, to show the potential for severe wildfire conditions.

**Forest plans**: The National Forest Management Act (NFMA) of 1976 requires forest plans be developed for each National Forest. The forest plan establishes direction for the multiple-use management of natural resources and includes land allocations and measures for environmental protection. Land allocations identify what uses are permissable and under what conditions.

**Fumigant**: A pesticide used in gaseous form.

**Fungicide**: A pesticide for control of fungi.

**Grazing allotment**: Designated area of land available for livestock grazing under permit.

**GYPCHEK**: A trade name for biological insecticide containing a virus specific to gypsy moth.

**Gypsy moth**: A nonnative foliage-feeding insect, *Lymartria dispar*, introduced into the United States in 1869 and spreading through much of America. It feeds on several hundred different species of trees and shrubs.

**Habitat**: The physical and environmental attributes necessary to support an organism; the place or site where plants or animals live and grow.

**Head month**: For grazing fee purposes, it is one month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule; or five sheep or goats.

**Herbicide**: A pesticide for control of unwanted vegetation.

**IMPROVE network**: An interagency effort, headed by the Environmental Protection Agency, to monitor air visibility within and adjacent to selected Class 1 airsheds.

**Insecticide**: A pesticide for control of insects.

**LMP (land management planning)**: The process by which the forest plans, required by the National Forest Management Act, are completed.

**MCF (thousand cubic feet)**: A unit of volume used to measure the amount of wood in logs. One cubic foot equals the volume in a cube 12 inches by 12 inches by 12 inches.

**MMCF (million cubic feet)**: A unit of volume equal to 1,000 MCF.

**MBF (thousand board feet)**: A unit of volume used to measure the amount of lumber that could be made from logs. One board foot equals a board one inch by 12 inches by 12 inches.

**MMBF (million board feet)**: A unit of volume equal to 1,000 MBF.

**Mountain pine beetle**: A bark-feeding native insect, *Dendroctonus ponderosae*, of the western United States. It feeds on several species of pines.

**National Forest**: 1) A unit of federally-owned land reserved or withdrawn from the public domain or acquired through purchase, exchange, or donation, and proclaimed by Congress as a National Forest; 2) An administrative unit of the National Forest System.

**National Grassland**: Lands designated National Grasslands by the Secretary of Agriculture and permanently held by the U.S. Department of Agriculture under Title III of the Bankhead-Jones Farm Tenant Act.

**NFS (National Forest System)**: 1) Defined by Congress in 1974 as units of federally-owned lands in the United States and its territories which are united into one integral system and dedicated to the long-term benefit of present and future generations. The system consists of all National Forest lands reserved or withdrawn from the public domain of the United States or acquired through purchase, exchange, donation, or other means. Also included are the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act and other lands, waters, or interests administered by the USDA Forest Service. 2) The branch of the USDA Forest Service established to protect and manage the National Forest System.

**Neotropical migrant birds**: Migratory bird species that nest in North America and winter in Mexico, the Caribbean, and Central and South America.

**Permitted livestock**: Livestock presently being grazed on an allotment under permit or those that were grazed under a permit during the preceding season, including their offspring retained for herd replacement.

**Pesticide**: Any substance or mixture of substances intended for controlling insects, rodents, fungi, weeds, and other forms of plants or animal life that are considered to be pests.

**Piscicide**: A pesticide used for control of fish.

**Predacide**: A pesticide used for control of predators.

**Range Betterment Fund**: A fund established by Title IV, section 401 (b)(1), of the Federal Land Policy and Management Act of 1976. Use is limited to National Forest System lands in the 16 contiguous western States. Funds are used to arrest range deterioration and improve forage conditions on deteriorated ranges to benefit forage production for livestock, wildlife, and watershed conditions.

**Rangelands**: Lands on which the native vegetation is predominately grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. Forested sites and nonforested sites providing forage and habitat for domestic and wild herbivores are included.

**Recovery**: The process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival are neutralized so that its long-term survival in nature can be ensured. The goal of this process is the maintenance of secure, self-sustaining wild populations of species with the minimum necessary investment of resources.

**Recreational rivers:** River or sections of rivers that are readily accessible by road or railroad that may have some development along their shoreline, and that may have undergone some impoundment or diversion in the past.

**Repellent**: A pesticide used to keep animal pests away.

**Research Natural Area**: Part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on the National Forest System. Research Natural Areas are for nonmanipulative research, observation, and study.

**Riparian areas**: Land situated along the bank of a stream or other body of water, usually characterized by plant communities dependent on the presence of free or unbound water at or near the ground surface.

**Rodenticide**: A pesticide used for rodent control.

**RVD (recreation visitor day)**: One recreation visitor day is the recreation use of the National Forest System land or water that aggregates to 12 visitor-hours. This may entail one person for 12 hours, 12 persons for one hour, or any equivalent combination of individual or group use, either continuous or intermittent.

**Scenic rivers:** Rivers or sections of rivers that are free of human-made impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

**Sensitive species**: Species occurring on the National Forest System for which population viability is a concern. Sensitive species are designated by Regional Foresters and are managed to prevent the need for federal listing as either threatened or endangered.

**Silvics**: The study of the life history and general characteristics of forest trees and stands, with particular reference to locality factors (environment) as a basis for the practice of silviculture.

**Silviculture**: The science and art of cultivating forests based on knowledge of silvics; more particularly, the theory and practice of controlling the establishment, composition, constitution, and growth of forests.

**SOURCE**: A correspondence course (NR435/DCE153) on valuation and landownership adjustment.

**Southern pine beetle**: A bark-feeding native insect, *Dendroctonus frontalis*, of the southeastern United States. It feeds on several species of southern pine.

**Spruce beetle**: A bark-feeding native insect, *Dendroctonus rufipennis*, of the northern portions of North America.

**S&PF (State and Private Forestry)**: A branch of the USDA Forest Service that provides technical assistance and expertise to State and local governments, and to private landowners.

**Stand (trees)**: A community of naturally or artificially established trees of any age sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities, thereby forming a silvicultural or management entity.

**Suitable range**: Land that is accessible, or can become accessible, to livestock and produces, or can produce, forage and can be grazed on a sustained-yield basis under reasonable management guidelines.

**Threatened species**: As defined under the Endangered Species Act (1973), a federally-listed plant and animal species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**Unsuitable range**: Land that should not or cannot be grazed because of unstable soils, steep topography, or low potential for forage production.

**Viable population**: A population of plants or animals whose estimated number and distribution of reproductive individuals provides a high likelihood of continued existence, generally throughout its current range.

**Visibility monitoring site**: A location equipped with automatic cameras that take photographs of the landscape at predetermined intervals of time to record the degree of smoke, haze, and other impediments to visibility of the air column.

**Western spruce budworm**: A foliage-feeding native insect, *Choristoneura occidentalis*, of the western United States. It feeds on Douglas-fir and several species of true firs and spruce.

**WFUD (wildlife fish user-day)**: One wildlife fish user-day is the recreation use of National Forest System land or water that aggregates to 12 visitor-hours. This may entail one person for 12 hours, 12 persons for one hour, or any equivalent combination of individual or group use, either continuous or intermittent, in order to hunt, fish, view, or study wildlife and/or fish.

**Wild and scenic river**: A river and its adjacent area designated for inclusion in the National Wild and Scenic Rivers System, as established by Congress in Public Law 90-542 (October 2, 1968), to "preserve certain rivers with outstanding natural, cultural, or recreational features in a free-flowing condition for the enjoyment of present and future generations." The National Wild and Scenic Rivers Act classifies rivers as "wild," "scenic," or "recreational." Regardless of classification, each designated river is administered with the goal of nondegradation and enhancement of the values which caused it to be designated.

**Wild rivers:** Rivers or sections of rivers that are free of human-made impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive, and waters unpolluted.

**Wilderness area**: An area of undeveloped federal land that Congress designated as wilderness and that retains its primeval character and influence, without permanent improvements or human habitation, and is protected and managed to preserve its natural conditions. An area that: 1) generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable; 2) has outstanding opportunities for solitude, or a primitive and unconfined type of recreation; 3) comprises at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition; and 4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value (Wilderness Act, 1964).

*Campers enjoy the warmth of a setting sun over Lake Michigan. The Nordhouse Wilderness Area within the Manistee National Forest borders the Great Lake.* Photo by Ken Cole

*North Clear Creek Falls off the Silver Thread Scenic Byway in the Rio Grande National Forest, Colorado.* Photo by Jim Hughes

# APPENDIX

## LEGISLATIVE BASIS FOR REPORT OF THE FOREST SERVICE

**Legislative basis**. Required by Section 8 (c) of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended (88 Stat. 476, as amended; 16 U.S.C. 1601-1614).

**Purpose of Report**. To provide information to Congress to assist them in their oversight responsibilities and to improve the accountability of agency (Forest Service) expenditures and activities.

**Responsibility**. Secretary of Agriculture to submit annual report at time of submission of the annual fiscal budget.

**Content Requirements for Report**. The Report will:

- Evaluate the component elements of the Renewable Resource Program. The Program shall be developed in accordance with principles set forth in Multiple-Use Sustained-Yield Act of 1960 and the National Environmental Policy Act of 1969 (Sec 4). The components are:

  National Forest System Component—protection, management and development of the National Forest System, including forest roads and trails.

  State and Private Component—Forest Service Cooperative Programs.

  International Forestry Component—international conservation programs.

  Research Component—the status of major research programs, significant findings and how these findings will be applied in National Forest System management (RPA Sec. 8 (c)).

  Other Forest Service Activities—response(s) to findings of the RPA Assessment.

- Set forth progress in implementing the RPA Program (Sec. 8 (d)).

- Cite accomplishments of the RPA Program as they relate to the objectives of the Assessment, in qualitative and quantitative term (Sec. 8 (d)).

- Contain appropriate measures of pertinent costs and benefits, assessing the balance between economic factors and environmental quality factors (Sec. 8 (d)).

- Indicate plans for implementing corrective actions and recommendations for new legislation where warranted (Sec. 8 (e)).

- Cite the amounts, types, and uses of herbicides and pesticides used in the National Forest System, including the beneficial or adverse effects of such uses (Sec. 3 (e)).

- Status on the progress of incorporation of mandated standards and guidelines into land and resource management plans (Sec. 6 (c)).

**Report Format**. The annual Reports will be structured for Congress in a concise summary form with necessary data in appendices (Sec. 8 (f)).

*Lookout operates an Osborne Fire Finder at the Devil's Head Fire Lookout on the Pike National Forest in Colorado in 1919.*
Photo by F E. Colburn

*Volunteers work on a Passport in Time excavation on the Uinta National Forest in Utah.* Photo by Jerry Wylie

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*Forester at work on the Umatilla National Forest, Oregon.* F.S. Photo

*Three Sisters Wilderness, Oregon.* Photo by Samuel T. Frear

# Tables


Photo by Lynn Cagle

## National Forest System

Table No. Page

## National Forest System--Continued

**Administration--Continued**



Photo by L.L. Davis

**Table 1—Summary of National Forest System accomplishments compared to funded output levels and 5-year average--fiscal year 1991**

| Resource area | Activity | Units 1/ | 1991 Funded | 1991 Accomplished 2/ | 1991 Percent of funded | 1987-1991 average accomplishment | 1991 as percent of 5-year average |
|---|---|---|---|---|---|---|---|
| Resource | | | | | | | |
| Recreation | Visitor use | MM RVD's | 268.6 | 278.8 | 104 | 255 | 109 |
| Wilderness | Management | MM acres | 33.6 | 33.6 | 100 | 33 | 102 |
| Wildlife & fish | Habitat improvement | | | | | | |
| | Appropriated funds | M acres | 215.8 | 247.4 | 115 | 246 3/ | 101 3/ |
| | K-V funds 4/ | M acres | - | 197.2 | N/A | 207 3/ | 95 3/ |
| | Habitat improvement | | | | | | |
| | Appropriated funds | Structures | 16,752.0 | 20,469.0 | 122 3/ | 21,874 3/ | 94 3/ |
| | K-V funds | Structures | - | 47,448.0 | N/A 3/ | 26,911 3/ | 176 3/ |
| | Habitat inventory | | | | | | |
| | Appropriated funds | M acres | 11,666.0 | 14,714.0 | 126 | 10,884 5/ | 135 5/ |
| | K-V funds | M acres | - | 98.7 | N/A | 113 5/ | 87 5/ |
| Range | Forage improvement | | | | | | |
| | Appropriated funds | M acres | 75.0 | 78.1 | 104 | 76 3/ | 103 3/ |
| | K-V funds | M acres | - | 28.3 | N/A | 29 3/ | 98 3/ |
| | Forage improvement | | | | | | |
| | Appropriated funds | Structures | 2,838.0 | 2,888.0 | 102 | 2,696 3/ | 107 3/ |
| | K-V funds | Structures | - | 490.0 | N/A | 496 3/ | 99 3/ |
| Timber | Sales offering | B bd. ft. | 9.5 | 6.2 | 65 | 10 | 61 |
| | Silvicultural exams | MM acres | 5.4 | 5.3 | 98 | 5 | 97 |
| | Reforestation 6/ | | | | | | |
| | Appropriated funds | M acres | 114.0 | 138.2 | 121 | 145 | 95 |
| | K-V funds | M acres | 322.8 | 350.5 | 109 | 316 | 111 |
| | Timber stand improvement | | | | | | |
| | Appropriated funds | M acres | 191.4 | 226.4 | 118 | 208 | 109 |
| | K-V funds | M acres | 169.8 | 167.3 | 99 | 151 | 111 |
| Soil & water | Resource improvements | | | | | | |
| | Appropriated funds | M acres | 26.1 | 28.8 | 110 | 22 | 131 |
| | K-V funds | M acres | - | 5.6 | N/A | 5 | 112 |
| | Soil inventory | M acres | 7,216.0 | 18,726.1 | 260 | 9,354 | 200 |
| Minerals | Leases and permits | Cases | 25,278.0 | 25,348.8 | 100 | 26,293 | 96 |
| Support | Trail construction/reconstruction | Miles | 1,495.9 | 1,921.3 | 128 | 1,597 | 120 |
| | Road construction | | | | | | |
| | Appropriated funds | | | | | | |
| | Construction | Miles | 93.8 7/ | 96.2 8/ | 103 | 271 | 36 |
| | Reconstruction | Miles | 829.2 7/ | 813.7 8/ | 98 | 1,024 | 79 |
| | Purchaser credit | | | | | | |
| | Construction 9/ | Miles | 1,804.7 | 1,219.0 | 68 | 1,729 | 71 |
| | Reconstruction 9/ | Miles | 4,286.5 | 2,895.4 | 68 | 3,368 | 86 |

See footnotes at end of table.

**Table 1—Summary of National Forest System accomplishments compared to funded output levels and 5-year average--fiscal year 1991--Continued**

| Resource area | Activity | Units 1/ | 1991 Funded | 1991 Accomplished 2/ | 1991 Percent of funded | 1987-1991 average accomplishment | 1991 as percent of 5-year average |
|---|---|---|---|---|---|---|---|
| Support (cont.) | Fuel management | | | | | | |
| | Appropriated funds | M acres | 328.1 | 325.4 | 99 | 323 | 101 |
| | Brush disposal funds | M acres | 338.6 | 373.1 | 110 | 367 | 102 |
| | Land acquired | | | | | | |
| | Purchase and donation | M acres | 77.7 | 67.9 | 87 | 86 | 79 |
| | Exchanges | M acres | 116.7 | 122.0 | 105 | 132 | 92 |
| | Landline location | Miles | 4,320.0 | 4,232.9 | 98 | 4,611 | 92 |

1/ M = thousand, MM = million, B = billion, RVD = recreation visitor day, AUM = animal unit month.
2/ Does not include accomplishments from contributed funding sources.
3/ Average from 1989 to 1991.
4/ K-V = Knutson Vandenberg Act.
5/ Average from 1990 to 1991.
6/ Includes natural regeneration without site preparation.
7/ Includes 2.3 miles of construction and 1.0 miles of reconstruction of Tongass Timber Supply Fund miles.
8/ Includes 4.2 miles of construction and 0.6 miles of reconstruction of Tongass Timber Supply Fund miles.
9/ Includes miles turned back to the Forest Service for construction or reconstruction (purchaser election program)

**Table 2–National Forest System funding--fiscal year 1991 compared to long-term program costs**

| | 1991 Actual | 1995 RPA1/ | Percent of 1991 Actual to 1995 RPA |
|---|---|---|---|
| | *1,000 constant 1991 dollars* | | |
| Minerals area management | 30,380 | 45,760 | 66 |
| Real estate management | (31,192) | - 2/ | N/A 3/ |
| Landline location | (29,844) | - | N/A |
| Real estate management and landline location | 61,036 | 94,640 | 64 |
| Maintenance of facilities | 24,866 | 30,160 | 82 |
| Cooperative law enforcement | 15,538 | 45,760 4/ | 34 |
| Forest road maintenance | 91,303 | 124,800 | 73 |
| Recreation use | (198,817) 5/ | - | N/A |
| Forest trail maintenance | (28,228) 5/ | - | N/A |
| Recreation use and trail maintenance | 227,045 | 240,240 | 95 |
| Sales administration and management | 263,133 5/ | 278,720 | 94 |
| Reforestation and stand improvement | 71,959 6/ | 73,840 | 97 |
| Wildlife and fish habitat management | 106,625 5/ | 158,080 | 67 |
| Range management | (39,473) | - | N/A |
| Range betterment fund | (4,546) | - | N/A |
| Range management and range betterment fund | 44,019 | 62,400 | 71 |
| Soil and water management | 72,153 5/ | 75,920 | 95 |
| Subtotal | 1,008,057 | 1,230,320 | 82 |
| General Administration (subtotal) | 292,333 | 344,240 | 85 |
| Forest fire protection | 179,899 | 204,880 | 88 |
| Fighting forest fires | 118,035 | 136,240 | 87 |
| Subtotal | 297,934 | 341,120 | 87 |
| Youth Conservation Corps (subtotal) | (1,000) | - | N/A |
| Construction: | | | |
| Construction of facilities 7/ | 64,204 | - | N/A |
| Forest road construction | 173,072 | - | N/A |
| Forest trail construction | 21,479 5/ | - | N/A |
| Forest roads purchaser construction 8/ | (118,690) | - | N/A |
| Subtotal | 258,755 | - | N/A |

See footnotes at end of table.

**Table 2–National Forest System funding--fiscal year 1991 compared to long-term program costs—Continued**

| | 1991 Actual | 1995 RPA1/ | Percent of 1991 Actual to 1995 RPA |
|---|---|---|---|
| Land acquisition | 88,695 | - | N/A |
| Acquisition of lands for National Forests, special acts | 1,097 | - | N/A |
| Acquisition of lands to complete land exchange | 105 | - | N/A |
| Early Winters land exchange | 497 | - | |
| Gifts, donations and bequests | 1 | - | N/A |
| Permanent appropriations | 569,144 | - | N/A |
| Trust funds | 281,974 | - | N/A |
| Subtotal | 941,513 | - | N/A |
| Total | 2,798,592 | N/A | N/A |

1/ Information from1990 RPA Program.
2/ - = Data not available.
3/ Not applicable.
4/ Includes NFS, cooperative, and drug enforcement/law enforcement activities.
5/ Includes excess timber receipt dollars.
6/ Includes reforestation trust fund dollars.
7/ Excludes construction of research facilities.
8/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.

Photo by Samuel T Frear

**Table 3–National Forest System funding--fiscal years 1987-91**

| | 1991 | 1990 1/ | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 dollars actual* | | |
| Minerals area management | 30,380 | 28,414 | 28,439 | 26,683 | 27,007 |
| Real estate management | 31,192 | 25,973 | 25,503 | 21,834 | 20,350 |
| Landline location | 29,844 | 30,710 | 28,678 | 26,651 | 26,980 |
| Maintenance of facilities | 24,866 | 21,142 | 17,553 | 16,533 | 15,055 |
| Cooperative law enforcement | 15,538 | 11,082 | 10,615 | 9,669 | 6,675 |
| Forest road maintenance | 91,303 | 96,384 | 80,729 | 83,740 | 63,073 |
| Forest trail maintenance | 28,228 | 24,459 | 25,185 | 20,026 | 11,385 |
| Sales administration and management | 263,133 | 251,796 | 229,476 | 185,561 | 189,640 |
| Reforestation and stand improvement 2/ | 71,959 | 99,995 | 102,597 | 84,923 | 90,098 |
| Recreation use | 198,817 | 153,613 | 149,566 | 123,742 | 113,287 |
| Wildlife and fish habitat management | 106,625 | 82,559 | 79,619 | 47,444 | 42,552 |
| Range management | 39,473 | 32,966 | 30,567 | 29,225 | 27,576 |
| Soil and water management | 72,153 | 61,612 | 57,429 | 35,271 | 33,981 |
| Subtotal | 1,003,511 | 920,705 | 865,956 | 711,302 | 667,659 |
| General Administration (subtotal) | 292,333 | 272,154 | 272,116 | 268,660 | 263,121 |
| Forest fire protection | 179,899 | 177,792 | 166,616 | 165,029 | 159,388 |
| Fighting forest fires | 118,035 | 611,850 | 125,000 | 125,000 | 125,000 |
| Subtotal | 297,934 | 789,642 | 291,616 | 290,029 | 284,388 |
| Youth Conservation Corps (subtotal) 3/ | (1,000) | (1,000) | (1,000) | (1,000) | (1,000) |
| Construction | | | | | |
| Construction of facilities 4/ | 64,204 | 36,185 | 33,914 | 24,735 | 25,663 |
| Forest road construction | 173,072 | 164,356 | 175,657 | 171,764 | 233,310 |
| Forest trail construction | 21,479 | 18,611 | 18,872 | 14,671 | 7,579 |
| Forest roads purchaser construction 5/ | (1,118,690) | (120,310) | (120,770) | (119,508) | (97,099) |
| Special projects | 0 | 0 | 0 | 0 | 10,215 |
| Subtotal | 258,755 | 219,152 | 228,443 | 211,170 | 276,767 |

See footnotes at end of table.

**Table 3–National Forest System funding--fiscal years 1987-91--Continued**

| | 1991 | 1990 1/ | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 dollars actual* | | |
| Land acquisition | 88,695 | 63,433 | 64,205 | 49,076 | 52,236 |
| Acquisition of lands for National Forests, special acts | 1,097 | 1,045 | 966 | 966 | 966 |
| Acquisition of lands to complete land exchange | 105 | 13 | 335 | 385 | 1,573 |
| Early Winters land exchange | 497 | 0 | 0 | 0 | 0 |
| Gifts, donations and bequests | 1 | 3 | 90 | 3 | 27 |
| Range betterment 3/ | 4,546 | 4,915 | 3,946 | 3,605 | 3,807 |
| Permanent appropriations | 569,144 | 638,040 | 474,117 | 452,270 | 359,643 |
| Trust funds | 281,974 | 260,137 | 267,748 | 296,334 | 254,019 |
| Total | 2,798,592 | 3,169,239 | 2,469,538 | 2,283,800 | 2,164,206 |

1/ Post sequestration with supplemental.
2/ Includes reforestation trust fund dollars.
3/ Appropriations Act required minimum level of funding from National Forest funds; amounts not included in totals.
1987 - operated a $3.6 million program from available funds.
1988 - operated a $3.0 million program from available funds.
1989 - operated a $2.2 million program from available funds.
1990 - operated a $2.1 million program from available funds.
1991 - operated a $1.8 million program from available funds.
4/ Excludes construction of research facilities.
5/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.
6/ Funding for special purposes:
Mt. Elden Work Center - $0.3 million.
Highway construction Mount St. Helens National Volcanic Monument - $9.915 million.

**Table 4–Summary of National Forest System 1991 accomplishments compared to long-term program trends**

| Resource area | Activity | Units 1/ | 1991 Actual | 1995 RPA 2/ | 1990 Actual | Percent of change comparisons: 1990 Actual to 1991 Actual | Percent of change comparisons: 1991 Actual to 1995 RPA |
|---|---|---|---|---|---|---|---|
| Final output 3/ | | | | | | | |
| Timber | Sales offering | B board ft | 6.2 | 10.8 | 11.1 | -44 | 74 |
| Recreation | Visitor use 4/ | MM RVD's | 278.8 | 308.0 | 263.1 | 6 | 10 |
| Range | Permitted grazing | MM AUM's | 9.5 | 9.3 | 9.6 | -1 | -2 |
| Minerals | Applications, proposals, and administration | M cases | 25.3 | 37.9 5/ | 25.9 | -2 | 50 |
| Wildlife & fish | User-days of recreation | MM WFUD's | 42.7 | 48.9 | 42.0 | 2 | 15 |
| Intermediate output 6/ | | | | | | | |
| Timber | Reforestation 7/ | M acres | 488.7 | 416.0 | 498.1 | -2 | -15 |
| | Timber stand improvement 7/ | M acres | 393.7 | 323.0 | 366.9 | 7 | -18 |
| Wildlife & fish | Habitat improvement | M acres | 444.6 8/ | - 9/ | 434.6 | 2 | N/A |
| | Habitat improvement | Structures | 67,917.0 8/ | - 9/ | 42,155.0 | 61 | N/A |
| | Habitat inventory | M acres | 14,812.7 8/ | - 9/ | 7,179.7 | 106 | N/A |
| Wilderness | Management | MM acres | 33.6 | 35.3 | 33.3 | 1 | 5 |
| Soil & water | Resource improvement | M acres | 34.4 8/ | 46.0 | 30.4 | 13 | 34 |
| | Soil inventory | M acres | 18726.1 8/ | - 9/ | 6,724.2 | 178 | N/A |
| Range | Forage improvements | M acres | 106.4 8/ | - 9/ | 96.4 | 10 | N/A |
| | Forage improvements | Structures | 3,378.0 8/ | - 9/ | 3,080.0 | 10 | N/A |
| Trails | Construction/ reconstruction | Miles | 1921.3 | 2,396.0 10/ | 1,637.0 | 17 | 25 |
| Roads | Construction/ reconstruction | Miles | 5024.3 11/ | 7,869.0 11/ | 6,519.3 11/ | -23 | 57 |
| Fire | Fuels management | M acres | 698.5 12/ | 781.0 | 710.6 12/ | -2 | 12 |
| Lands | Purchase and donation | M acres | 67.9 | - 9/ | 82.0 | -17 | N/A |

1/ B = billion, MM = million, M = thousand, RVD's = recreation visitor-days, AUM's = animal unit months, WFUD's = wildlife and fish user days.
2/ Information derived from1990 RPA Program.
3/ Final output = forest and rangeland goods and services purchased or consumed by the private sector or individual consumers.
4/ WFUD's are included in RVD's.
5/ Reported as operations in the 1990 RPA Program.
6/ Intermediate output = work performed by the Forest Service that contributes to the production of final outputs.
7/ Includes acres from carryover funds.
8/ Acres accomplished with appropriated funds, excess timber receipt funds, and K-V funds.
9/ These items were not reported in the RPA Program.
10/ Does not include trail reconstruction.
11/ Includes appropriated and purchaser roads.
12/ Includes accomplishments from appropriated funds and brush disposal funds.

**Table 5–Draft and final forest plan environmental impact statements filed with the Environmental Protection Agency by Region as of September 30, 1991 1/**

**Northern Region**

*Final*
- Flathead (MT)
- Lewis & Clark (MT)
- Beaverhead (MT)
- Helena (MT)
- Lolo (MT)
- Bitterroot (MT)
- Custer (MT)
- Deerlodge (MT)
- Nez Perce (ID)
- Gallatin (MT)
- Idaho Panhandle (ID)
- Clearwater (ID)
- Kootenai (MT)

**Rocky Mountain Region**

*Final*
- Rio Grande (CO)
- Nebraska (NE)
- Bighorn (WY)
- Arapaho-Roosevelt (CO)
- Grand Mesa, Uncompahgre, and Gunnison (CO)
- Routt (CO)
- San Juan (CO)
- Black Hills (SD)
- White River (CO)
- Pike-San Isabel (CO)
- Medicine Bow (WY)
- Shoshone (WY)

**Southwestern Region**

*Final*
- Cibola (NM)
- Tonto (AZ)
- Carson (NM)
- Coronado (AZ)
- Gila (NM)
- Lincoln (NM)
- Prescott (AZ)
- Apache-Sitgreaves (AZ)
- Coconino (AZ)
- Santa Fe (NM)
- Kaibab (AZ)

**Intermountain Region**

*Final*
- Bridger-Teton (WY)
- Boise (ID)
- Uinta (UT)
- Wasatch-Cache (UT)
- Targhee (ID)
- Caribou (ID)
- Fishlake (UT)
- Toiyabe (NV)
- Dixie (UT)
- Humboldt (NV)
- Payette (ID)
- Challis (ID)
- Ashley (UT)
- Sawtooth (ID)
- Manti-LaSal (UT)
- Salmon (ID)

**Pacific Southwest Region**

*Draft*
- Modoc (CA) 2/
- Stanislaus (CA) 2/
- Sierra (CA) 2/
- Lassen (CA) 2/
- Klamath (CA) 3/
- Shasta-Trinity (CA) 3/
- Mendocino (CA) 3/
- Six Rivers (CA) 3/

*Final*
- Cleveland (CA)
- Angeles (CA)
- Plumas (CA)
- Sequoia (CA)
- Los Padres (CA)
- Inyo (CA)
- Eldorado (CA)
- San Bernardino (CA)
- Lake Tahoe Basin Management Unit (CA)
- Tahoe (CA)

**Pacific Northwest Region**

*Final*
- Deschutes (OR)
- Okanogan (WA)
- Wallowa-Whitman (OR)
- Wenatchee (WA)
- Olympic (WA)
- Siuslaw (OR)
- Umatilla (OR)
- Gifford Pinchot (WA)
- Mt. Hood (OR)
- Umpqua (OR)
- Malheur (OR)
- Rogue River (OR)
- Mt. Baker (WA)
- Winema (OR)
- Willamette (OR)
- Colville (WA)
- Siskiyou (OR)
- Fremont (OR)
- Ochoco (OR)

**Southern Region**

*Final*
- Francis Marion (SC)
- Sumter (SC)
- Mississippi (MS)
- Kisatchie (LA)
- Chattahoochee-Oconee (GA)
- Daniel Boone (KY)
- Jefferson (VA)
- George Washington (VA)
- Caribbean (PR)
- Cherokee (TN)
- Ozark-St. Francis (AR)
- Florida (FL)
- Ouachita (AR)
- Alabama (AL)
- Croatan-Uwharrie (NC)
- Nantahala-Pisgah (NC)
- Texas (TX)

**Eastern Region**

*Final*
- Hoosier (IN)
- Nicolet (WI)
- Superior (MN)
- Monongahela (WV)
- Chippewa (MN)
- Allegheny (PA)
- Huron-Manistee (MI)
- Chequamegon (WI)
- Mark Twain (MO)
- Hiawatha (MI)
- Ottawa (MI)
- White Mountain (NH)
- Green Mountain (VT)
- Shawnee (IL)
- Wayne (OH)

**Alaska Region**

*Draft*
- Tongass (AK) 4/

*Final*
- Chugach (AK)

1/ Includes forest plans filed in previous years.
2/ Finals to be issued by February 1992
3/ Withdrew previous draft due to spotted owl listing.
4/ 1979 Tongass plan under revision.

**Table 6–Lands administered by the Forest Service as of September 30, 1991**

| State, Commonwealth, or Territory 1/ | National Forests, purchase units, research areas, and other areas | National Grasslands | Land utilization projects | Total |
|---|---|---|---|---|
| | | *Acres* | | |
| Alabama | 658,124 | 0 | 40 | 658,164 |
| Alaska | 22,219,636 | 0 | 0 | 22,219,636 |
| Arizona | 11,238,606 | 0 | 0 | 11,238,606 |
| Arkansas | 2,508,594 | 0 | 0 | 2,508,594 |
| California | 20,600,511 | 18,425 | 0 | 20,618,936 |
| Colorado | 13,833,138 | 628,379 | 0 | 14,461,517 |
| Connecticut | 24 | 0 | 0 | 24 |
| Florida | 1,127,977 | 0 | 0 | 1,127,977 |
| Georgia | 859,228 | 0 | 0 | 859,228 |
| Hawaii | 1 | 0 | 0 | 1 |
| Idaho | 20,389,810 | 47,749 | 0 | 20,437,559 |
| Illinois | 266,439 | 0 | 0 | 266,439 |
| Indiana | 188,365 | 0 | 0 | 188,365 |
| Kansas | 0 | 108,175 | 0 | 108,175 |
| Kentucky | 670,374 | 0 | 0 | 670,374 |
| Louisiana | 600,764 | 0 | 0 | 600,764 |
| Maine | 52,860 | 0 | 0 | 52,860 |
| Michigan | 2,815,370 | 0 | 959 | 2,816,329 |
| Minnesota | 2,810,181 | 0 | 0 | 2,810,181 |
| Mississippi | 1,149,932 | 0 | 0 | 1,149,932 |
| Missouri | 1,462,028 | 0 | 13,104 | 1,475,132 |
| Montana | 16,806,196 | 0 | 0 | 16,806,196 |
| Nebraska | 257,569 | 94,435 | 0 | 352,004 |
| Nevada | 5,797,357 | 0 | 0 | 5,797,357 |
| New Hampshire | 720,016 | 0 | 0 | 720,016 |
| New Mexico | 9,184,524 | 136,417 | 240 | 9,321,181 |
| New York | 13,232 | 0 | 0 | 13,232 |
| North Carolina | 1,231,743 | 0 | 0 | 1,231,743 |
| North Dakota | 743 | 1,105,046 | 0 | 1,105,789 |
| Ohio | 203,151 | 0 | 0 | 203,151 |
| Oklahoma | 250,339 | 46,300 | 0 | 296,639 |
| Oregon | 15,538,812 | 111,352 | 856 | 15,651,020 |
| Pennsylvania | 513,103 | 0 | 0 | 513,103 |
| Puerto Rico | 27,831 | 0 | 0 | 27,831 |
| South Carolina | 607,222 | 0 | 0 | 607,222 |
| South Dakota | 1,133,024 | 862,670 | 0 | 1,995,694 |
| Tennessee | 627,696 | 0 | 0 | 627,696 |
| Texas | 635,823 | 117,531 | 0 | 753,354 |
| Utah | 8,098,589 | 0 | 0 | 8,098,589 |
| Vermont | 340,130 | 0 | 0 | 340,130 |
| Virgin Islands | 147 | 0 | 0 | 147 |
| Virginia | 1,645,209 | 0 | 0 | 1,645,209 |
| Washington | 9,150,722 | 0 | 738 | 9,151,460 |
| West Virginia | 1,025,080 | 0 | 0 | 1,025,080 |
| Wisconsin | 1,516,726 | 0 | 0 | 1,516,726 |
| Wyoming | 8,682,517 | 572,211 | 0 | 9,254,728 |
| Total | 187,459,463 | 3,848,690 | 15,937 | 191,324,090 |

1/ Unlisted states have no lands administered by the Forest Service.

**Table 7–Miles of landline location by Region--fiscal year 1991**

| Region | Total miles boundary | 1991 mileage accomplishment | Total miles surveyed |
|---|---|---|---|
| Northern | 30,664 | 607 | 8,048 |
| Rocky Mountain | 51,433 | 452 | 5,740 |
| Southwestern | 19,991 | 256 | 6,767 |
| Intermountain | 28,659 | 246 | 5,205 |
| Pacific Southwest | 29,577 | 683 | 12,821 |
| Pacific Northwest | 25,627 | 433 | 14,878 |
| Southern | 42,280 | 738 | 37,971 |
| Eastern | 42,642 | 744 | 10,504 |
| Alaska 1/ | 1,536 | 73 | 1,290 |
| Total | 272,409 | 4,232 | 103,224 |

1/ Does not reflect changes due to Alaska Native Claims Settlement Act of 1971 (85 Stat. 688), as amended, and the Alaska Statehood Act of 1958 (72 Stat. 339), as amended. As the land selections are overlapping and/or in a constant state of change, the Region is not keeping track of the boundary changes at this time.

**Table 8–Land acquisition and exchange--fiscal year 1991**

| | Acres | Cases | Value |
|---|---|---|---|
| | | | *Million dollars* |
| Purchase | 68,744 1/ | 400 | 65 |
| Exchange | 121,997 | 144 | 151 |
| Donation | 598 | 11 | 2.1 |
| Total | 191,339 | 555 | 218.1 |

1/ Includes 67,321 acres purchased through L&WCF; 550 acres through Acquisitions, Special Acts; and 873 acres purchased through contributions.

**Table 9–Wildlife and fish habitat inventory and improvement by Region--fiscal year 1991 1/**

| Region | Wildlife | Inland fish | Anadromous fish | Threatened, endangered & sensitive species | Total |
|---|---|---|---|---|---|
| Northern | | | | | |
| Acres of inventory | 767,469 | 943 | 264 | 317,730 | 768,676 |
| Acres of improvement | 14,306 | 198 | 160 | 5,819 | 14,664 |
| Structures | 858 | 566 | 260 | 142 | 1,684 |
| Rocky Mountain | | | | | |
| Acres of inventory | 172,249 | 18,374 | 0 | 493,822 | 190,623 |
| Acres of improvement | 29,964 | 347 | 0 | 215 | 30,311 |
| Structures | 2,016 | 532 | 0 | 74 | 2,548 |
| Southwestern | | | | | |
| Acres of inventory | 950,436 | 5,235 | 0 | 1,245,844 | 955,671 |
| Acres of improvement | 39,949 | 119 | 0 | 9,904 | 40,068 |
| Structures | 978 | 1,706 | 0 | 82 | 2,684 |
| Intermountain | | | | | |
| Acres of inventory | 769,551 | 2,957 | 0 | 3,146,271 | 772,508 |
| Acres of improvement | 25,032 | 348 | 62 | 1,466 | 25,442 |
| Structures | 457 | 726 | 101 | 308 | 1,284 |
| Pacific Southwest | | | | | |
| Acres of inventory | 101,412 | 34,414 | 3,059 | 1,128,455 | 138,885 |
| Acres of improvement | 9,922 | 1,236 | 109 | 9,006 | 11,267 |
| Structures | 1,855 | 630 | 391 | 123 | 2,876 |
| Pacific Northwest | | | | | |
| Acres of inventory | 165,749 | 21,532 | 32,982 | 467,911 | 220,263 |
| Acres of improvement | 25,377 | 2,879 | 412 | 354 | 28,668 |
| Structures | 39,827 | 1,999 | 2,434 | 94 | 44,260 |
| Southern | | | | | |
| Acres of inventory | - 2/ | - | - | - | - |
| Acres of improvement | 147,323 | 4,654 | 0 | 62,413 | 151,977 |
| Structures | 2,814 | 1,825 | 0 | 1,006 | 4,639 |
| Eastern | | | | | |
| Acres of inventory | 490,206 | 5,320 | 244 | 105,812 | 495,770 |
| Acres of improvement | 31,788 | 4,057 | 308 | 4,671 | 36,153 |
| Structures | 3,338 | 1,978 | 373 | 522 | 5,689 |
| Alaska | | | | | |
| Acres of inventory | 538,995 | 75 | 3,174,115 | 752,285 | 3,713,185 |
| Acres of improvement | 5,946 | 0 | 5,968 | 280 | 11,914 |
| Structures | 192 | 23 | 65 | 22 | 280 |
| Total 3/ | | | | | |
| Acres of inventory | 3,956,067 | 88,849 | 3,210,664 | 7,658,130 | 14,913,710 4/ |
| Acres of improvement | 329,607 | 13,838 | 7,019 | 94,128 | 444,592 5/ |
| Structures | 52,334 | 9,985 | 3,624 | 2,373 | 68,316 6/ |

1/ Includes activities accomplished with appropriated funds, K-V funds, and excess timber receipts.
2/ Acres of inventory not reported for the Southern Region.
3/ May not add due to rounding.
4/ Includes 14,714,037 acres accomplished with appropriated funds, 98,744 acres with K-V funds, and 100,928 acres with excess timber receipts. Does not include 1,549,429 acres accomplished with contributed funds.
5/ Includes 235,495 acres accomplished with appropriated funds, 197,206 acres with K-V funds, and 11,891 acres with excess timber receipts. Does not include 41,945.9 acres accomplished with contributed funds.
6/ Includes 20,469 structures accomplished with appropriated funds, 47,448 structures with K-V funds, and 399 structures with excess timber receipts. Does not include 5,956 structures accomplished with contributed funds.

**Table 10–Total recreation use on National Forest System lands by State--fiscal years 1987-91**

| State, Commonwealth, or Territory 1/ | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 RVD's 2/* | | |
| Alabama | 676.7 | 698.1 | 685.5 | 741.4 | 850.4 |
| Alaska | 5,717.9 | 5,413.6 | 4,636.2 | 4,354.5 | 4,085.3 |
| Arizona | 21,548.8 | 19,038.5 | 18,997.5 | 18,831.2 | 18,839.8 |
| Arkansas | 2,109.0 | 2,440.9 | 2,377.0 | 2,358.5 | 2,278.7 |
| California | 65,220.8 | 61,006.6 | 63,685.3 | 59,516.9 | 57,975.4 |
| Colorado | 25,998.0 | 25,204.2 | 23,238.2 | 21,484.0 | 22,583.3 |
| Florida | 3,080.8 | 2,961.2 | 2,851.5 | 2,787.5 | 2,731.5 |
| Georgia | 2,839.1 | 2,833.3 | 2,715.1 | 2,707.0 | 2,669.4 |
| Idaho | 12,908.5 | 11,819.1 | 11,738.3 | 10,736.3 | 10,806.5 |
| Illinois | 843.4 | 1,637.7 | 950.1 | 891.5 | 830.0 |
| Indiana | 594.0 | 568.8 | 587.6 | 430.1 | 483.2 |
| Kansas | 66.1 | 61.3 | 48.0 | 38.2 | 21.8 |
| Kentucky | 2,111.5 | 2,446.5 | 2,327.0 | 2,301.3 | 2,248.7 |
| Louisiana | 486.4 | 527.3 | 512.7 | 502.3 | 418.1 |
| Maine | 60.7 | 57.7 | 52.8 | 47.6 | 47.6 |
| Michigan | 8,153.0 | 4,916.4 | 4,725.4 | 4,319.6 | 4,409.8 |
| Minnesota | 4,956.4 | 5,399.3 | 5,147.6 | 4,449.6 | 4,382.3 |
| Mississippi | 1,285.1 | 1,177.1 | 1,236.9 | 1,240.4 | 1,179.5 |
| Missouri | 1,742.3 | 1,712.6 | 1,704.8 | 1,705.0 | 1,716.4 |
| Montana | 10,595.3 | 9,703.6 | 9,412.5 | 8,843.7 | 9,912.3 |
| Nebraska | 147.1 | 148.7 | 142.0 | 181.1 | 163.0 |
| Nevada | 3,283.1 | 3,277.9 | 3,081.5 | 2,656.8 | 2,353.8 |
| New Hampshire | 4,013.5 | 2,675.6 | 2,683.7 | 2,783.0 | 2,474.1 |
| New Mexico | 8,065.3 | 7,704.2 | 7,465.6 | 7,227.5 | 6,446.6 |
| New York | 45.0 | 71.5 | 22.4 | 25.6 | 22.8 |
| North Carolina | 5,691.8 | 5,472.0 | 5,036.2 | 4,973.2 | 4,572.1 |
| North Dakota | 198.6 | 168.5 | 184.3 | 186.7 | 131.3 |
| Ohio | 521.6 | 504.4 | 429.5 | 410.7 | 411.7 |
| Oklahoma | 373.0 | 386.8 | 341.4 | 331.4 | 320.6 |
| Oregon | 21,036.5 | 21,035.7 | 18,231.1 | 19,598.1 | 19,210.1 |
| Pennsylvania | 2,976.5 | 2,631.2 | 2,605.1 | 2,621.4 | 2,394.1 |
| Puerto Rico | 280.1 | 185.6 | 396.0 | 399.7 | 382.2 |
| South Carolina | 942.8 | 816.1 | 974.5 | 916.5 | 920.0 |
| South Dakota | 3,095.4 | 2,965.5 | 2,737.3 | 2,734.9 | 2,687.4 |
| Tennessee | 2,923.8 | 2,826.0 | 2,655.3 | 2,561.7 | 2,432.2 |
| Texas | 2,253.1 | 2,154.8 | 2,057.1 | 1,863.6 | 1,923.9 |
| Utah | 13,336.7 | 12,744.1 | 13,312.8 | 14,454.8 | 13,736.9 |
| Vermont | 1,570.5 | 1,368.9 | 1,352.3 | 1,154.1 | 1,029.1 |
| Virginia | 4,173.4 | 3,900.1 | 3,946.3 | 3,804.0 | 3,726.4 |
| Washington | 22,458.0 | 22,451.1 | 18,017.7 | 15,477.6 | 15,058.3 |
| West Virginia | 1,339.8 | 1,234.4 | 1,146.3 | 1,152.1 | 1,137.2 |
| Wisconsin | 2,215.3 | 2,094.9 | 1,978.6 | 2,000.1 | 1,952.5 |
| Wyoming | 6,914.3 | 6,608.8 | 6,068.0 | 6,514.5 | 6,502.0 |
| Total | 278,849.0 | 263,050.6 | 252,495.0 | 242,315.7 | 238,458.3 |

1/ States not listed have no Forest Service recreation program.
2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

**Table 11–State summary of total recreation use on National Forest System lands by activity—fiscal year 1991**

| State, Commonwealth, or Territory 1/ | Camping, picnicking & swimming | Mechanized travel & viewing scenery | Hiking, horseback riding & water travel | Winter sports | Resorts, cabins & organization camps |
|---|---|---|---|---|---|
| | | | *1,000 RVD's 2/* | | |
| Alabama | 200.4 | 110.3 | 62.6 | 0.0 | 0.4 |
| Alaska | 322.2 | 3,577.9 | 377.2 | 127.2 | 143.1 |
| Arizona | 6,281.6 | 9,681.9 | 1,597.1 | 240.9 | 899.5 |
| Arkansas | 598.2 | 523.8 | 193.4 | 0.0 | 22.9 |
| California | 17,665.0 | 25,128.8 | 4,463.6 | 2,812.6 | 7,477.7 |
| Colorado | 5,280.5 | 7,085.5 | 2,125.9 | 7,205.2 | 662.6 |
| Florida | 1,709.7 | 475.1 | 172.5 | 0.0 | 213.6 |
| Georgia | 885.7 | 857.1 | 357.4 | 1.2 | 41.6 |
| Idaho | 3,712.4 | 3,536.7 | 1,101.8 | 921.1 | 681.3 |
| Illinois | 176.9 | 325.7 | 131.0 | 0.8 | 7.5 |
| Indiana | 234.6 | 61.2 | 62.4 | 0.0 | 0.0 |
| Kansas | 15.9 | 23.7 | 1.9 | 0.0 | 0.6 |
| Kentucky | 647.6 | 674.1 | 256.0 | 2.3 | 21.4 |
| Louisiana | 152.3 | 125.5 | 11.1 | 0.0 | 22.1 |
| Maine | 19.4 | 8.6 | 13.0 | 1.2 | 2.4 |
| Michigan | 1,732.6 | 2,393.9 | 2,264.2 | 259.2 | 121.3 |
| Minnesota | 1,539.7 | 1,001.1 | 544.8 | 82.8 | 455.1 |
| Mississippi | 246.6 | 331.0 | 122.5 | 0.0 | 7.7 |
| Missouri | 509.2 | 506.6 | 228.4 | 0.0 | 10.7 |
| Montana | 2,185.1 | 3,287.3 | 1,352.5 | 626.3 | 343.2 |
| Nebraska | 32.5 | 20.7 | 15.0 | 0.4 | 38.0 |
| Nevada | 970.7 | 963.2 | 375.3 | 298.6 | 142.6 |
| New Hampshire | 687.6 | 1,743.5 | 463.2 | 933.8 | 86.6 |
| New Mexico | 2,661.9 | 1,807.8 | 758.7 | 705.6 | 217.7 |
| New York | 31.6 | 1.7 | 3.6 | 1.3 | 0.0 |
| North Carolina | 1,431.5 | 2,003.4 | 813.2 | 7.6 | 99.2 |
| North Dakota | 23.0 | 80.3 | 16.5 | 0.9 | 0.0 |
| Ohio | 149.5 | 115.4 | 70.4 | 1.3 | 0.0 |
| Oklahoma | 54.1 | 175.5 | 26.8 | 0.2 | 0.0 |
| Oregon | 6,758.1 | 7,954.9 | 1,676.9 | 648.8 | 1,409.2 |
| Pennsylvania | 952.3 | 1,227.3 | 253.5 | 8.7 | 84.8 |
| Puerto Rico | 103.5 | 99.1 | 23.5 | 0.0 | 7.8 |
| South Carolina | 247.6 | 221.0 | 131.2 | 0.0 | 2.8 |
| South Dakota | 225.8 | 2,301.2 | 127.9 | 15.0 | 115.4 |
| Tennessee | 1,170.7 | 841.7 | 305.3 | 4.9 | 102.8 |
| Texas | 622.5 | 420.5 | 97.9 | 0.0 | 22.8 |
| Utah | 4,734.5 | 3,452.2 | 1,210.5 | 1,080.0 | 723.4 |
| Vermont | 320.6 | 224.1 | 71.1 | 722.9 | 46.0 |
| Virginia | 1,013.1 | 1,347.6 | 415.9 | 11.9 | 19.9 |
| Washington | 7,536.4 | 8,365.8 | 2,295.5 | 779.6 | 1,320.9 |
| West Virginia | 519.0 | 252.7 | 117.7 | 2.5 | 28.4 |
| Wisconsin | 553.9 | 710.5 | 94.5 | 26.1 | 22.3 |
| Wyoming | 1,698.9 | 1,893.8 | 1,024.4 | 320.7 | 623.6 |
| Total | 76,614.9 | 95,939.7 | 25,827.8 | 17,851.6 | 16,248.9 |

See footnotes at end of table.

**Table 11–State summary of total recreation use on National Forest System lands by activity—fiscal year 1991--Continued**

| Hunting | Fishing | Non-Consumptive Fish & Wildlife Use | Other recreation activities | Total | State, Commonwealth, or Territory 1/ |
|---|---|---|---|---|---|
| | | *1,000 RVD's 2/* | | | |
| 165.6 | 69.8 | 5.4 | 62.2 | 676.7 | Alabama |
| 136.3 | 392.3 | 31.7 | 610.0 | 5,717.9 | Alaska |
| 862.2 | 770.0 | 197.6 | 1,018.0 | 21,548.8 | Arizona |
| 517.7 | 110.2 | 23.9 | 118.9 | 2,109.0 | Arkansas |
| 1,407.2 | 2,962.9 | 459.4 | 2,843.6 | 65,220.8 | California |
| 1,368.4 | 1,366.5 | 125.5 | 777.9 | 25,998.0 | Colorado |
| 233.0 | 170.6 | 20.4 | 85.9 | 3,080.8 | Florida |
| 376.1 | 191.4 | 35.5 | 93.1 | 2,839.1 | Georgia |
| 1,013.4 | 928.7 | 116.1 | 897.0 | 12,908.5 | Idaho |
| 121.6 | 29.6 | 10.0 | 40.3 | 843.4 | Illinois |
| 116.4 | 99.7 | 3.7 | 16.0 | 594.0 | Indiana |
| 8.2 | 5.2 | 3.0 | 7.6 | 66.1 | Kansas |
| 202.8 | 202.5 | 9.9 | 94.9 | 2,111.5 | Kentucky |
| 105.2 | 32.7 | 1.2 | 36.3 | 486.4 | Louisiana |
| 8.7 | 4.4 | 1.4 | 1.6 | 60.7 | Maine |
| 686.4 | 411.3 | 67.8 | 216.3 | 8,153.0 | Michigan |
| 357.3 | 773.9 | 38.8 | 162.9 | 4,956.4 | Minnesota |
| 382.9 | 85.5 | 29.0 | 79.9 | 1,285.1 | Mississippi |
| 265.1 | 106.9 | 19.3 | 96.1 | 1,742.3 | Missouri |
| 1,032.9 | 833.7 | 103.1 | 831.2 | 10,595.3 | Montana |
| 12.4 | 3.1 | 0.0 | 25.0 | 147.1 | Nebraska |
| 215.6 | 66.1 | 65.5 | 185.5 | 3,283.1 | Nevada |
| 35.1 | 27.6 | 12.6 | 23.5 | 4,013.5 | New Hampshire |
| 612.7 | 340.2 | 142.8 | 817.9 | 8,065.3 | New Mexico |
| 4.2 | 1.4 | 0.3 | 0.9 | 45.0 | New York |
| 791.4 | 314.8 | 31.4 | 199.3 | 5,691.8 | North Carolina |
| 62.8 | 2.8 | 4.0 | 8.3 | 198.6 | North Dakota |
| 127.3 | 23.7 | 3.6 | 30.4 | 521.6 | Ohio |
| 62.7 | 21.2 | 15.0 | 17.5 | 373.0 | Oklahoma |
| 739.2 | 1,050.4 | 189.1 | 609.9 | 21,036.5 | Oregon |
| 199.0 | 160.1 | 19.4 | 71.4 | 2,976.5 | Pennsylvania |
| 0.0 | 0.0 | 1.7 | 44.5 | 280.1 | Puerto Rico |
| 209.2 | 49.0 | 12.3 | 69.7 | 942.8 | South Carolina |
| 105.9 | 64.1 | 6.0 | 134.1 | 3,095.4 | South Dakota |
| 231.6 | 175.9 | 27.0 | 63.9 | 2,923.8 | Tennessee |
| 228.2 | 776.8 | 16.8 | 67.6 | 2,253.1 | Texas |
| 705.7 | 713.4 | 57.0 | 660.0 | 13,336.7 | Utah |
| 81.4 | 20.8 | 31.6 | 52.0 | 1,570.5 | Vermont |
| 806.6 | 332.3 | 34.0 | 192.1 | 4,173.4 | Virginia |
| 651.6 | 596.7 | 212.0 | 699.5 | 22,458.0 | Washington |
| 216.5 | 133.7 | 7.1 | 62.2 | 1,339.8 | West Virginia |
| 243.3 | 452.2 | 9.7 | 102.8 | 2,215.3 | Wisconsin |
| 574.4 | 448.0 | 44.1 | 286.4 | 6,914.3 | Wyoming |
| 16,284.2 | 15,322.1 | 2,245.7 | 12,514.1 | 278,849.0 | Total |

1/ States not listed have no Forest Service recreation program.
2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

**Table 12–Trail miles on the National Forest System by State--fiscal years 1989-91 1/**

| State, Commonwealth, or Territory 2/ | 1991 | | | 1990 | | | 1989 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Constructed 3/ | Maintained | Total | Constructed 3/ | Maintained | Total | Constructed 3/ | Maintained |
| Alabama | 162.9 | 14.5 | 133.9 | 207 | 8 | 164 | 216 | 14 | 185 |
| Alaska | 867.2 | 7.5 | 452.8 | 879 | 10 | 469 | 804 | 36 | 428 |
| Arizona | 3,982.9 | 116.8 | 587.1 | 3,989 | 117 | 545 | 3,745 | 131 | 563 |
| Arkansas | 768.9 | 26.5 | 460.1 | 558 | 34 | 365 | 465 | 14 | 465 |
| California | 14,045.5 | 348.4 | 6,553.6 | 13,303 | 241 | 5,977 | 13,295 | 192 | 8,121 |
| Colorado | 9,307.3 | 148.3 | 4,444.5 | 8,655 | 225 | 5,263 | 7,801 | 388 | 4,784 |
| Florida | 341.3 | 0.0 | 341.3 | 345 | 9 | 345 | 350 | 1 | 204 |
| Georgia | 626.3 | 4.6 | 486.0 | 627 | 4 | 498 | 500 | 11 | 496 |
| Idaho | 18,459.7 | 133.6 | 9,672.3 | 17,990 | 118 | 8,704 | 14,119 | 149 | 5,956 |
| Illinois | 157.0 | 14.5 | 79.7 | 339 | 14 | 73 | 187 | 0 | 47 |
| Indiana | 146.0 | 6.0 | 146.0 | 140 | 10 | 140 | 160 | 4 | 160 |
| Kansas | 36.9 | 0.0 | 13.9 | 36 | 0 | 14 | 31 | 0 | 9 |
| Kentucky | 462.0 | 23.7 | 441.6 | 487 | 10 | 487 | 505 | 8 | 276 |
| Louisiana | 142.1 | 3.0 | 134.5 | 138 | 0 | 138 | 128 | 10 | 122 |
| Maine | 120.0 | 5.0 | 120.0 | 171 | 1 | 171 | 171 | 0 | 0 |
| Michigan | 3,193.6 | 110.3 | 2,613.4 | 2,428 | 90 | 1,940 | 2,254 | 88 | 2,199 |
| Minnesota | 2,600.5 | 14.0 | 2,600.5 | 2,587 | 53 | 2,587 | 2,740 | 33 | 2,740 |
| Mississippi | 254.9 | 1.0 | 223.6 | 276 | 9 | 196 | 238 | 21 | 238 |
| Missouri | 628.0 | 22.7 | 628.0 | 1,308 | 25 | 987 | 1,283 | 21 | 995 |
| Montana | 14,135.9 | 110.7 | 9,383.1 | 13,854 | 127 | 7,714 | 15,456 | 132 | 9,585 |
| Nebraska | 50.0 | 0.0 | 50.0 | 50 | 0 | 50 | 58 | 0 | 0 |
| Nevada | 1,631.5 | 12.6 | 853.8 | 1,635 | 13 | 497 | 1,901 | 20 | 676 |
| New Hampshire | 1,308.0 | 6.9 | 1,308.0 | 1,308 | 3 | 1,047 | 1,258 | 10 | 0 |
| New Mexico | 3,942.0 | 37.4 | 886.0 | 4,270 | 19 | 1,298 | 3,832 | 31 | 714 |
| New York | 31.0 | 1.2 | 31.0 | 31 | 1 | 31 | 29 | 1 | 25 |
| North Carolina | 1,433.2 | 35.5 | 991.6 | 1,457 | 11 | 713 | 1,457 | 16 | 713 |
| North Dakota | 37.4 | 1.5 | 36.6 | 34 | 3 | 4 | 29 | 29 | 26 |
| Ohio | 260.0 | 20.0 | 260.0 | 240 | 49 | 240 | 185 | 19 | 185 |
| Oklahoma | 145.8 | 24.0 | 74.7 | 175 | 0 | 92 | 167 | 0 | 78 |
| Oregon | 10,530.4 | 211.0 | 5,862.7 | 10,133 | 130 | 6,787 | 8,687 | 112 | 6,033 |
| Pennsylvania | 648.8 | 8.6 | 334.9 | 646 | 24 | 252 | 636 | 11 | 636 |
| Puerto Rico | 26.0 | 0.0 | 26.0 | 26 | 2 | 17 | 20 | 1 | 20 |
| South Carolina | 373.7 | 31.3 | 299.5 | 258 | 27 | 258 | 381 | 7 | 266 |

See footnotes at end of table

**Table 12–Trail miles on the National Forest System by State--fiscal years 1989-91--Continued**

| State, Commonwealth, or Territory 2/ | 1991 | | | 1990 | | | 1989 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Constructed 3/ | Maintained | Total | Constructed 3/ | Maintained | Total | Constructed 3/ | Maintained |
| South Dakota | 251.3 | 18.3 | 241.3 | 231 | 8 | 231 | 193 | 30 | 94 |
| Tennessee | 673.7 | 12.5 | 152.4 | 663 | 17 | 663 | 637 | 7 | 385 |
| Texas | 282.5 | 12.1 | 249.0 | 274 | 1 | 274 | 283 | 0 | 168 |
| Utah | 5,284.4 | 30.8 | 2,634.3 | 4,903 | 16 | 2,484 | 4,339 | 84 | 2,393 |
| Vermont | 965.2 | 30.7 | 711.4 | 965 | 4 | 200 | 965 | 13 | 200 |
| Virginia | 1,839.9 | 16.5 | 558.6 | 2,060 | 24 | 694 | 1,860 | 11 | 974 |
| Washington | 8,183.1 | 129.1 | 5,718.1 | 7,869 | 108 | 5,681 | 8,001 | 190 | 5,925 |
| West Virginia | 891.4 | 10.5 | 277.2 | 818 | 20 | 454 | 815 | 57 | 334 |
| Wisconsin | 1,314.5 | 44.6 | 1,136.3 | 1,670 | 21 | 1,261 | 1,963 | 12 | 1,114 |
| Wyoming | 6,041.8 | 114.8 | 3,349.3 | 6,334 | 31 | 3,102 | 6,237 | 30 | 2,585 |
| Total 4/ | 116,584.5 | 1,921.3 | 65,558.6 | 114,367 | 1,637 | 63,104 | 108,381 | 1,944 | 61,117 |

1/ Includes work accomplished by Human Resource Programs and volunteers.
2/ States not listed have no Forest Service recreation program.
3/ Miles constructed include construction of new trails and reconstruction of existing trails. The predominant activity is reconstruction. Funds used are appropriated, other, and timber receipts.
4/ Totals may not add due to rounding.

**Table 13—Additions to the National Wild and Scenic Rivers System--fiscal year 1991**

| River | State | Date | Miles |
|---|---|---|---|
| Clarks Fork of the Yellowstone River | Wyoming | 11/28/90 | 20.8 |
| Smith | California | 11/16/90 | 341.1 |
| Total | | | 361.9 |

F.S. Photo

**Table 14–Acres of the National Wilderness Preservation System by State--calendar years 1987-91 1/**

| State, Commonwealth, or Territory 2/ | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 acres 3/* | | |
| Alabama | 33 | 33 | 33 | 33 | 19 |
| Alaska | 5,753 | 5,453 | 5,453 | 5,453 | 5,453 |
| Arizona | 1,345 | 1,345 | 1,345 | 1,338 | 1,316 |
| Arkansas | 116 | 116 | 115 | 115 | 115 |
| California | 3,902 | 3,902 | 3,921 | 3,921 | 3,922 |
| Colorado | 2,587 | 2,587 | 2,587 | 2,587 | 2,587 |
| Florida | 73 | 73 | 73 | 73 | 73 |
| Georgia | 89 | 89 | 89 | 89 | 89 |
| Idaho | 3,960 | 3,960 | 3,960 | 3,960 | 3,960 |
| Illinois | 26 | 0 | 0 | 0 | 0 |
| Indiana | 13 | 13 | 13 | 13 | 13 |
| Kentucky | 16 | 16 | 17 | 17 | 17 |
| Louisiana | 9 | 9 | 9 | 9 | 9 |
| Maine | 12 | 12 | 0 | 0 | 0 |
| Michigan | 92 | 92 | 92 | 92 | 92 |
| Minnesota | 799 | 799 | 799 | 798 | 798 |
| Mississippi | 5 | 5 | 6 | 6 | 6 |
| Missouri | 63 | 63 | 63 | 63 | 63 |
| Montana | 3,372 | 3,372 | 3,372 | 3,372 | 3,372 |
| Nebraska | 8 | 8 | 8 | 8 | 8 |
| Nevada | 788 | 788 | 65 | 65 | 65 |
| New Hampshire | 103 | 103 | 103 | 103 | 103 |
| New Mexico | 1,388 | 1,388 | 1,388 | 1,388 | 1,388 |
| North Carolina | 102 | 102 | 101 | 101 | 101 |
| Oklahoma | 14 | 14 | 14 | 14 | 0 |
| Oregon | 2,080 | 2,080 | 2,079 | 2,078 | 2,078 |
| Pennsylvania | 9 | 9 | 9 | 9 | 9 |
| South Carolina | 17 | 17 | 17 | 17 | 17 |
| South Dakota | 10 | 10 | 10 | 10 | 10 |
| Tennessee | 66 | 66 | 67 | 67 | 67 |
| Texas | 35 | 35 | 36 | 36 | 36 |
| Utah | 774 | 774 | 774 | 775 | 775 |
| Vermont | 59 | 59 | 59 | 59 | 59 |
| Virginia | 87 | 87 | 89 | 90 | 65 |
| Washington | 2,571 | 2,571 | 2,571 | 2,571 | 2,571 |
| West Virginia | 81 | 81 | 81 | 81 | 78 |
| Wisconsin | 42 | 42 | 42 | 42 | 42 |
| Wyoming | 3,080 | 3,080 | 3,080 | 3,081 | 3,081 |
| Total 4/ | 33,579 | 33,253 | 32,540 | 32,534 | 32,457 |

1/ Includes all changes to the Wilderness Preservation System through the 100th Congress.
2/ States not listed have no National Forest System acres in the National Wilderness Preservation System.
3/ Acreage for most states is estimated pending final map compilation; therefore, minor changes may occur between years.
4/ Total acreage is shown. The difference between the total and column sum is due to rounding.

**Table 15–Additions to the National Wilderness Preservation System--fiscal year 1991**

| Public Law | State | Date | Number of new areas | Number of additions | Number of adjustments | Acres |
|---|---|---|---|---|---|---|
| P.L. 101-626 | Alaska | 11/28/90 | 5 | 1 | 0 | 296,680 |
| P.L. 101-633 | Illinois | 11/28/90 | 7 | 0 | 0 | 25,549 |
| Total | | | 12 | 1 | 0 | 322,229 |

*Miners Ridge, Glacier Peak Wilderness, Washington.* F.S. Photo

**Table 16–Fuels treatment acreage accomplished by appropriation--fiscal year 1991**

| Region | Accomplishment | | | |
|---|---|---|---|---|
| | Forest fire protection | Volunteer and contributed work | Brush disposal funds | Total |
| | *Acres* | | | |
| Northern | 9,944 | 0 | 40,763 | 50,707 |
| Rocky Mountain | 5,966 | 0 | 14,087 | 20,053 |
| Southwestern | 55,297 | 1,300 | 72,381 | 128,978 |
| Intermountain | 4,758 | 0 | 31,585 | 36,343 |
| Pacific Southwest | 4,763 | 50 | 50,553 | 55,366 |
| Pacific Northwest | 23,098 | 3,204 | 159,603 | 185,905 |
| Southern | 218,827 | 4 | 0 | 218,831 |
| Eastern | 2,488 | 29 | 4,134 | 6,651 |
| Alaska | 279 | 0 | 0 | 279 |
| Total | 325,420 | 4,587 | 373,106 | 703,113 |

*Prescribed burn area, Croatan National Forest.* Photo by Ken Hammond

Table 17–Pesticide use report--fiscal year 1991

| Common name | Target pest or purpose | Quantity used Pounds 2/ | | Units treated 1/ | |
|---|---|---|---|---|---|
| Herbicides: | | | | | |
| Amitrole | Noxious weed control | 6.00 | | 8.00 | |
| Atrazine | Research | 16.00 | | 8.00 | |
| Bifenox | Nursery weed control | 441.00 | | 91.69 | |
| Bromacil/ Diuron | Firebreak management | 9.60 | / | 20,200.00 | square feet |
| | | 9.60 | | | |
| | General weed control | 25.50 | / | 365,471.00 | square feet |
| | | 25.50 | | | |
| | Rights-of-way | 12.00 | / | 3.00 | |
| | | 12.00 | | | |
| | Rights-of-way | 1.00 | | 5.00 | square feet |
| | | 1.00 | | | |
| Clopyralid | Noxious weed control | 3.00 | | 40.00 | |
| Copper triethanolamine/ Oust | | 55.00 | / | 55.00 | |
| | | 6.87 | | | |
| Dacthal 3/ | Nursery weed control | 286.75 | | 46.30 | |
| Dicamba | General weed control | 2.00 | | 2.00 | |
| | Noxious weed control | 625.75 | | 582.00 | |
| | Site preparation | 6.00 | | 365.00 | |
| Dicamba/ Picloram | Noxious weed control | 4.00 | / | 16.00 | |
| | | 4.00 | | | |
| Dicamba/ Triclopyr | Site preparation | 222.00 | / | 444.00 | |
| | | 167.00 | | | |
| Diuron | Rights-of-way | 8.00 | | 2,078.00 | square feet |
| Diuron/ Tebuthium | Rights-of-way | 0.12 | / | 0.25 | |
| | | 0.12 | | | |
| Endothall | Noxious weed control | 2.5 | | 150 | |
| Fosamine ammonium | Rights-of-way | 1,315.00 | | 303.00 | |
| Glyphosate | Conifer release | 2,651.14 | | 3,085.00 | |
| | General weed control | 1,755.35 | | 847.50 | |
| | General weed control | 1.00 | | 2,000.00 | square feet |
| | Hardwood release | 85.19 | | 227.00 | |
| | Noxious weed control | 584.95 | | 894.29 | |
| | Nursery weed control | 421.94 | | 86.00 | |
| | Poisonous plant control | 23.00 | | 13.00 | |
| | Range management | 20.00 | | 44.00 | |
| | Research | 35.50 | | 21.00 | |
| | Rights-of-way | 58.00 | | 59.00 | |
| | Rights-of-way | 1.00 | | 1.00 | side miles |
| | Site preparation | 1,816.20 | | 2,911.00 | |
| | Thinning | 56.00 | | 84.00 | |
| | Wildlife habitat improvement | 391.80 | | 582.00 | |
| Glyphosate/ Imazapyr | Site preparation | 152.00 | / | 214.00 | |
| | | 20.00 | | | |
| Glyphosate/ Imazapyr | Research | 45.00 | / | 30.00 | |
| | | 11.00 | | | |
| Glyphosate Oryzalin | General weed control | 0.04 | / | 5.00 | |
| | | 0.04 | | | |
| Glyphosate/ Oust | Rights-of-way | 2.32 | / | 12.40 | |
| | | 49.60 | | | |
| | Site preparation | 325.00 | / | 325.00 | |
| | | 14.33 | | | |
| Glyphosate/ Oust/ Triclopyr | Site preparation | 600.00 | / | 400.00 | |
| | | 75.00 | / | | |
| | | 400.00 | | | |
| Glyphosate/ Triclopyr | Conifer release | 577.79 | / | 563.00 | |
| | | 587.19 | | | |

See footnotes at end of table

**Table 17--Pesticide use report--fiscal year 1991--Continued**

| Common name | Target pest or purpose | Quantity used Pounds 2/ | Units treated 1/ | |
|---|---|---|---|---|
| Herbicides: (Cont.) | | | | |
| Hexazinone | Conifer release | 4,055.50 | 3,767.00 | |
| | Research | 1.00 | 0.30 | |
| | Rights-of-way | 2.00 | 23.00 | side miles |
| | Site preparation | 11,106.20 | 6,314.50 | |
| | Wildlife habitat improvement | 100.00 | 113.00 | |
| Hexazinone/ Oust | Conifer release | 125.00 / 12.75 | 544.00 | |
| Imazapyr | Conifer release | 287.00 | 2,685.00 | |
| | General weed control | 2.00 | 3.00 | |
| | Rights-of-way | 49.75 | 120.00 | |
| | Site preparation | 775.00 | 1,964.00 | |
| Linuron | General weed control | 15.00 | 10.00 | |
| MSMA | Noxious weed control | 112.00 | 207.00 | |
| Napropamide | Nursery weed control | 138.00 | 140.00 | |
| Oust | Conifer release | 115.11 | 1,520.00 | |
| | General weed control | 8.11 | 433.00 | |
| | Rights-of-way | 0.25 | 2.00 | |
| | Rights-of-way | 0.75 | 23.00 | side miles |
| | Site preparation | 23.49 | 188.00 | |
| Picloram | General weed control | 16.50 | 33 | |
| | Noxious weed control | 2,815.24 | 7,615.29 | |
| | Poisonous plant control | 85.50 | 200.00 | |
| Picloram/ Imazapyr | Site preparation | 1.50 / 1.50 | 2.00 | |
| Sethoxydim | Nursery weed control | 47.00 | 70.00 | |
| Simazine | Aquatic weed control | 4.50 | 2.19 | acre feet |
| | General weed control | 2.39 | 1,200.00 | square feet |
| Tebuthiuron | Range management | 813.00 | 329.00 | |
| | Wildlife habitat | 755.00 | 755.00 | |
| Triclopyr | Conifer release | 20,267.35 | 22,246.50 | |
| | General weed control | 934.00 | 916.00 | |
| | Hardwood release | 3,270.00 | 2,929.00 | |
| | Noxious weed control | 560.00 | 246.00 | |
| | Range management | 16.00 | 9.00 | |
| | Research | 2.00 | 4.00 | |
| | Rights-of-way | 1,967.00 | 528.00 | |
| | Rights-of-way | 43.00 | 87.40 | side miles |
| | Site preparation | 22,336.69 | 25,689.00 | |
| | Thinning | 2,147.00 | 2,099.00 | |
| | Wildlife habitat improvement | 4,496.00 | 4,114.00 | |
| Triclopyr/ Imazapyr | Site preparation | 7.00 / 3.00 | 4.00 | |
| 2,4-D | Noxious weed control | 45,898.79 | 3,700.28 | |
| | Nursery weed control | 3.00 | 49.00 | |
| | Range management | 570.00 | 874.00 | |
| | Rights-of-way | 75.00 | 50.00 | |
| | Site preparation | 4.00 | 32.00 | |
| 2,4-D/ Clopyralid | Noxious weed control | 15.00 / 2.80 | 1,200.00 | |
| 2,4-D/ Dicamba | General weed control | 300.00 / 75.00 | 150.00 | |
| | Noxious weed control | 6,477.68 / 2,898.80 | 6,200.80 | |
| | Poisonous plant control | 12.00 / 4.00 | 15.00 | |
| 2,4-D/ Dicamba/ Picloram | Noxious weed control | 1.89 / 1.89 / 1.89 | 7.50 | |

See footnotes at end of table.

**Table 17–Pesticide use report--fiscal year 1991--Continued**

| Common name | Target pest or purpose | Quantity used Pounds 2/ | Units treated 1/ | |
|---|---|---|---|---|
| Herbicides: (Cont.) | | | | |
| 2,4-D/ Glyphosate | General weed control | 1.50 / 1.50 | 8.00 | |
| | Rights-of-way | | | |
| 2,4-D/ MCPA | General weed control | 3.60 / 3.60 | 10.50 | |
| 2,4-D/ Metsulfuron methyl | Noxious weed control | 28.50 / 1.00 | 56.00 | |
| 2,4-D/ Picloram | Noxious weed control | 24.00 / 6.00 | 230.00 | side miles |
| | Noxious weed control | 8,746.28 / 14,461.90 | 10,826.69 | |
| | Poisonous plant control | 49.85 / 16.60 | 92.00 | |
| 2,4-DP | Rights-of-way | 2,122.00 | 327.00 | |
| Total 1991 herbicide use | | 173,355.84 | 121,915.79 | * |

* Plus:
364.4 side miles
2.19 acre feet
390,954.04 square feet

See footnotes at end of table.

Photo by Jim Hughes

**Table 17–Pesticide use report--fiscal year 1991--Continued**

| Common name | Target pest or purpose | Quantity used Pounds 2/ | | Units treated 1/ | |
|---|---|---|---|---|---|
| Insecticides: | | | | | |
| Acephate | Balsam woolly aphids | 0.07 | | 4,448.00 | square feet |
| | Conifer defoliation | 0.37 | | 1.00 | tree group |
| | Greenhouse insects | 0.10 | | 300.00 | seedlings |
| | Greenhouse insects | 0.16 | | 757.00 | square feet |
| | Imported fire ant | 1.50 | | 200.00 | burrows |
| | Miscellaneous insects | 0.54 | | 4.00 | trees |
| | Seedbugs | 153.00 | | 44.00 | |
| | Tussock moth | 16.50 | | 8.00 | trees |
| Amdro | Imported fire ant | 0.87 | | 350.00 | treatment stations |
| Azinphos-methyl | Cone moth | 309.00 | | 103.00 | |
| *Bacillus thuringiensis* | Cone moth | 29,700.00 | BIU | 990.00 | |
| *Bacillus thuringiensis* | Gypsy moth | 1,821,056.00 | BIU | 32,690.00 | |
| *Bacillus thuringiensis var. israelensis* | Mosquitoes | 1.00 | BIU | 18.00 | |
| *Bacillus thuringiensis* | Western spruce budworm | 851.20 | BIU | 45.00 | |
| Carbaryl | Aphids | 0.90 | | 4,980.00 | square feet |
| | Cottonwood leaf beetle | 1.50 | | 1.50 | |
| | Grasshoppers | 16,559.00 | | 90,987.00 | |
| | Greenhouse insects | 0.30 | | 600.00 | square feet |
| | Mormon cricket | 2,274.00 | | 3,548.00 | |
| | Mountain pine beetle | 40.00 | | 9.00 | tree group |
| | Mountain pine beetle | 4.00 | | 20.00 | |
| | Western pine beetle | 612.00 | | 1,050.00 | trees |
| Carbofuran | Cone borers | 12.50 | | 1.00 | greenhouses |
| | Tip moths | 4.30 | | 1,863.00 | seedlings |
| Chlorpyrifos | Ants | 1.69 | | 2.00 | |
| | Carpenter ants | 0.25 | | 1.00 | buildings |
| | Seedbugs | 300.00 | | 44.00 | |
| | Southern pine beetle | 12.00 | | 270.00 | trees |
| | Southern pine beetle | 17.12 | | 256.00 | acre feet |
| | Webworms | 18.00 | | 21.50 | |
| Coumaphos | Mites | 225.00 | | 12,000.00 | head of cattle |
| | Miscellaneous insects | 4.00 | | 3,200.00 | head of cattle |
| Diazinon | Aphids | 2.29 | | 7.00 | greenhouses |
| | Cutworms | 48.00 | | 12.00 | |
| | Fleas | 2.10 | | 10.00 | |
| | Fleas | 180.00 | | 180.00 | burrows |
| | Miscellaneous insects | 1.36 | | 1.40 | |
| | Nursery insects | 74.00 | | 141.50 | |
| Diflubenzuron | Gypsy moth | 13.30 | | 443.00 | |
| Dimethoate | Research | 0.02 | | 2,000.00 | square feet |
| | Tip moths | 5.00 | | 8.00 | |
| Disparlure | Gypsy moth | 195.05 | | 291.00 | |
| Fenbutatin-oxide | Spider mites | 0.20 | | 555.00 | seedlings |
| Fenvalerate | Cone moth | 68.40 | | 1,116.00 | |
| | Cone borers | 12.00 | | 16.00 | |
| Lindane | Bark beetles | 5.00 | | 150.00 | trees |
| | Southern pine beetle | 1.06 | | 21.00 | trees |
| | Southern pine beetle | 16.00 | | 20.00 | |
| Malathion | Aphids | 0.07 | | 1.27 | square feet |
| | Aphids | 0.50 | | 7.00 | greenhouses |
| | Balsam woolly aphid | 1.75 | | 7,107.00 | square feet |
| | Grasshoppers | 1,593.00 | | 3,304.00 | |
| Methomyl | Aphids | 4.50 | | 9.00 | |
| | Gypsy moth | 160.00 | | 169.00 | |

See footnotes at end of table.

**Table 17–Pesticide use report--fiscal year 1991--Continued**

| Common name | Target pest or purpose | Quantity used Pounds 2/ | | Units treated 1/ | |
|---|---|---|---|---|---|
| Insecticides: (Cont.) | | | | | |
| Methyl bromide | Texas leaf-cutting ant | 45.00 | | 10.00 | |
| Permethrin | Seedbugs | 1.00 | | 1,000.00 | trees |
| Petroleum oil | Cutworms | 5.00 | | 292.00 | square feet |
| Pheromones | Douglas-fir beetle | 50.00 | | 500.00 | trees |
| | Mountain pine beetle | 20.85 | | 52.00 | |
| | Tussock moth | 132.30 | | 600.00 | |
| | Western pine beetle | 100.00 | | 100.00 | trees |
| | | 20.85 | | 52.00 | |
| Pyrethrins | Ants | 0.18 | | 5.00 | |
| Sulfuryl fluoride | Termites | 300.00 | | 3.00 | buildings |
| Total 1991 insecticide use (including aerial use) | | 23,627.45 | * | 134,773.90 | ** |

* Pounds only; does not include 1,851,608.2 BIU's.

** Acres, including BIU use on 33,743 acres, plus:
- 3,103 trees
- 10 tree groups
- 20,185.27 square feet
- 15,200 head of cattle
- 4 buildings
- 350 treatment stations
- 15 greenhouses
- 380 burrows
- 2,718 seedlings
- 256 acre feet

See footnotes at end of table.

Table 17–Pesticide use report--fiscal year 1991--Continued

| Common name | Target pest or purpose | Quantity used Pounds 2/ | Units treated 1/ | |
|---|---|---|---|---|
| Fungicides and Fumigants: | | | | |
| Benomyl | Botrytis | 5.39 | 25.00 | |
| | Damping-off | 6.00 | 30,000.00 | seedlings |
| | Greenhouse diseases | 0.62 | 4.00 | greenhouses |
| | Nursery fungi | 177.00 | 70.00 | |
| | Nursery fungi | 703.00 | 7,369,000.00 | seedlings |
| | Nursery root rot | 0.20 | 180.00 | square feet |
| | Other diseases | 1.00 | 7.00 | greenhouses |
| | Phompsis canker | 36.60 | 80.00 | |
| | Seedling blights | 10.50 | 12.40 | |
| Borax | Annosus root disease | 99.00 | 906.00 | stumps |
| | Annosus root disease | 15,361.00 | 26,338.00 | |
| | Annosus root disease | 400.00 | 12,000.00 | square feet |
| Bordeaux mixture | Lophodermium | 0.63 | 0.80 | |
| Captan | Damping-off | 35.00 | 35.00 | |
| | Fusarium | 12.50 | 7.00 | greenhouses |
| | Greenhouse diseases | 5.97 | 8.00 | greenhouses |
| | Greenhouse diseases | 0.79 | 5,810.00 | square feet |
| Chlorothalonil | Botrytis | 2.37 | 1.00 | tree group |
| | Lophodermium | 0.45 | 0.40 | |
| | Nursery blight | 16.69 | 12.40 | |
| | Nursery fungi | 208.00 | 70.00 | |
| | Other diseases | 17.00 | 11.00 | |
| | Phoma blight | 2.90 | 1.00 | |
| | Tomato blights | 1.50 | 3.00 | |
| Dazomet | Nematodes | 127.00 | 0.30 | |
| | Nursery fungi | 14,269.00 | 41.00 | |
| | Nursery root rot | 3,531.30 | 10.90 | |
| DCNA | Botrytis | 1.30 | 6.00 | greenhouses |
| | Botrytis | 8.40 | 71,200.00 | square feet |
| Dodine | Shot hole disease | 2.50 | 2.00 | |
| Ethazol | Nursery root rot | 0.02 | 329.00 | square feet |
| Ethazol/ Thiophonate-methyl | Other diseases | 0.20 | 6.00 | greenhouses |
| Maneb | Botrytis | 3.00 | 20.00 | |
| Metalaxyl | Nursery root rot | 269.00 | 4.30 | |
| | Nursery root rot | 0.50 | 5,892.00 | square feet |
| Methyl bromide/ Chloropicrin | Nematodes | 1,331.00 / 1,331.00 | 11.00 | |
| | Damping-off | 4,333.00 / 2,134.00 | 20.00 | |
| | Nursery root rot | 11,007.50 / 5,657.50 | 43.50 | |
| | Fusarium | 5,749.00 / 2,813.00 | 26.00 | |

See footnotes at end of table.

Table 17–Pesticide use report--fiscal year 1991--Continued

| Common name | Target pest or purpose | Quantity used Pounds 2/ | Units treated 1/ | |
|---|---|---|---|---|
| Fungicides and Fumigants: (Cont.) | | | | |
| Thiram | Damping-off | 3.30 | 1,331.00 | pounds of seed |
| | Other diseases | 260.00 | 7,218.00 | pounds of seed |
| Triadimefon | Fusarium | 1.00 | 6.00 | greenhouses |
| | Fusiform rust | 10.00 | 31.00 | |
| | Fusiform rust | 1.00 | 1,264.00 | pounds of seed |
| | Sirococcus tip blight | 1.00 | 1.00 | |
| | White pine blister rust | 1.25 | 5.00 | |
| Zineb | Lophoderium | 6.00 | 5.00 | |
| Total 1991 fungicide and fumigant use | | 69,955.88 | 26,880.00 | * |

* Plus:
9,813 pounds of seed
7,399,000 seedlings
906 stumps
44 greenhouses
95,411 square feet
1 tree group

See footnotes at end of table.

*Larch sawfly caterpillars.* F.S. Photo

**Table 17–Pesticide use report--fiscal year 1991--Continued**

| Common name | Target pest or purpose | Quantity used Pounds 2/ | Units treated 1/ | |
|---|---|---|---|---|
| Predacides and Piscicides: | | | | |
| Antimycin | Undesirable fish | 10.00 | 6.00 | stream miles |
| Rotenone | Undesirable fish | 49.00 | 41.00 | stream miles |
| | Undesirable fish | 2,033.71 | 1,448.00 | |
| Sodium cyanide | Coyotes | 0.10 | 43,575.00 | |
| Total 1991 predacide and piscicide use | | 2,092.81 | 45,023.00 | |
| Repellents: | | | | |
| Putrescent egg solids | Deer | 21.00 | 215,000.00 | seedlings |
| | Deer | 434.37 | 3,665.00 | |
| Total 1991 repellent use | | 455.37 | 3,665.00 | |
| Rodenticides: | | | | |
| Aluminum phosphide | Prairie dog | 6.00 | 24.00 | |
| Diphacinone | Ground squirrels | 8.00 | 35.00 | |
| | Pocket gophers | 0.06 | 5.00 | tree groups |
| Strychnine | Pocket gophers | 118.92 | 30,634.00 | |
| Zinc phosphide | Prairie dog | 53.00 | 7,477.00 | |
| | Other rodents | 0.20 | 35.00 | |
| | Pocket gophers | 0.12 | 5.00 | tree groups |
| Total 1991 rodenticide use | | 186.30 | 38,205.00 | |
| Grand total pesticide use | | 269,674 | 370,454 | |

1/ Acres, unless other units are indicated.
2/ Pounds, unless other units are indicated. BIU = billion international units.
3/ Registered trademark; no common name.

**Table 18–Reforestation funding and accomplishments by funding source--fiscal years 1987-91**

| | Appropriated | Knutson-Vandenberg | Total |
|---|---|---|---|
| 1987 | | | |
| Million dollars 1/ | 55.8 | 106.8 | 162.6 |
| 1,000 acres | 139.4 | 254.8 | 394.2 |
| Constant dollars/acre | 400.3 | 419.2 | 412.5 2/ |
| 1988 | | | |
| Million dollars 1/ | 52.8 | 128.1 | 180.9 |
| 1,000 acres | 133.3 3/ | 282.8 4/ | 416.1 |
| Constant dollars/acre | 396.1 | 453.0 | 434.8 2/ |
| 1989 | | | |
| Million dollars 1/ | 62.5 5/ | 124.5 | 187.0 |
| 1,000 acres | 148.6 6/ | 327.3 | 475.9 |
| Constant dollars/acre | 420.6 | 380.4 | 392.9 2/ |
| 1990 | | | |
| Million dollars 1/ | 52.4 | 120.2 7/ | 172.6 |
| 1,000 acres | 145.0 8/ | 353.1 | 498.1 |
| Constant dollars/acre | 361.4 | 340.4 | 346.5 2/ |
| 1991 | | | |
| Million dollars 1/ | 51.0 | 105.8 | 156.8 |
| 1,000 acres | 138.2 9/ | 350.5 | 488.7 |
| Constant dollars/acre | 369.0 | 301.9 | 320.9 2/ |

1/ All dollars are constant 1991. No General Administration funds included. Does not include funds for nursery and tree improvement.
2/ Weighted average.
3/ Does not include the 24,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.
4/ Does not include the 11,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.
5/ Includes $9.7 million of resource management excess timber receipts. These funds are to be used to reforest lands damaged by forest fires in 1987 and 1988.
6/ Includes 53,000 acres of certified natural regeneration without site preparation reported as established in FY 1989, but does not include 16,300 acres of other carryover reforestation.
7/ Although $152 million were authorized, only $115.6 were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust pool for future obligations.
8/ Includes 59,000 acres of certified natural regeneration without site preparation reported as established in FY 1990.
9/ Includes 65,687 acres of certified natural regeneration without site preparation, but does not include 14,477 acres accomplished with contributed funding.

Photo by Paul Keller

**Table 19—Reforestation program needs--fiscal years 1991-93**

| | Current or anticipated | Annual program appropriated funds 1/ | |
|---|---|---|---|
| | *1,000 acres* | *1,000 acres* | *Million dollars* |
| 10/1/90 balance | 1,144 | | |
| Fiscal year 1991 | | | |
| New needs 2/ | 474 | | |
| Accomplishments | -503 | 138.2 | 51.026 |
| 10/1/91 balance | 1,115 | | |
| Fiscal year 1992 | | | |
| New needs 2/ | 400 | | |
| Projected accomplishments | -439 | 114.7 | 21.41 |
| 10/1/92 balance | 1,076 | | |
| Fiscal year 1993 | | | |
| New needs 2/ | 375 | | |
| Projected accomplishments | -483 | | |
| 10/1/93 balance | 968 | | |

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.
2/ New needs are the results of timber harvests, regeneration failures, and natural disasters such as fires, storms, insects, storms, insects, diseases, and other changes.

Photo by K.D Swan

**Table 20–Reforestation needs as of October 1, 1991, by State, forest, and site productivity class**

| State, Commonwealth, or Territory 1/ National Forest | Acres by site productivity class 2/ 0-49 | 50-84 | 85-119 | 120+ | Total acres |
|---|---|---|---|---|---|
| Alabama | | | | | |
| NFs in Alabama (subtotal) | 194 | 1,694 | 1,984 | 612 | 4,484 |
| Alaska | | | | | |
| Chugach | 102 | 214 | 0 | 0 | 316 |
| Tongass-Chatham | 0 | 684 | 2,163 | 3,283 | 6,130 |
| Tongass-Ketchikan | 0 | 121 | 1,271 | 18,134 | 19,526 |
| Tongass-Stikine | 0 | 494 | 2,390 | 7,020 | 9,904 |
| Subtotal | 102 | 1,513 | 5,824 | 28,437 | 35,876 |
| Arizona | | | | | |
| Apache-Sitgreaves | 30 | 443 | 34 | 0 | 507 |
| Coconino | 8,920 | 3,370 | 0 | 0 | 12,290 |
| Coronado | 0 | 0 | 0 | 0 | 0 |
| Kaibab | 2,328 | 1,219 | 0 | 0 | 3,547 |
| Prescott | 0 | 0 | 0 | 0 | 0 |
| Tonto | 430 | 0 | 0 | 0 | 430 |
| Subtotal | 11,708 | 5,032 | 34 | 0 | 16,774 |
| Arkansas | | | | | |
| Ouachita | 193 | 4,502 | 6,490 | 941 | 12,126 |
| Ozark-St. Francis | 32 | 2,822 | 1,181 | 11 | 4,046 |
| Subtotal | 225 | 7,324 | 7,671 | 952 | 16,172 |
| California | | | | | |
| Angeles | 89 | 150 | 260 | 0 | 499 |
| Cleveland | 0 | 158 | 0 | 0 | 158 |
| Eldorado | 0 | 134 | 1,497 | 3,779 | 5,410 |
| Inyo | 0 | 289 | 183 | 0 | 472 |
| Klamath | 339 | 4,569 | 6,392 | 5,296 | 16,596 |
| Lake Tahoe Basin | 0 | 47 | 531 | 0 | 578 |
| Lassen | 34 | 9,252 | 3,473 | 2,056 | 14,815 |
| Los Padres | 0 | 0 | 0 | 0 | 0 |
| Mendocino | 221 | 2,955 | 2,312 | 1,102 | 6,590 |
| Modoc | 30 | 2,259 | 1,222 | 614 | 4,125 |
| Plumas | 0 | 354 | 11,638 | 1,537 | 13,529 |
| Rogue River | 0 | 377 | 368 | 0 | 745 |
| San Bernardino | 59 | 389 | 59 | 0 | 507 |
| Sequoia | 0 | 2,657 | 1,093 | 4,152 | 7,902 |
| Shasta | 0 | 220 | 439 | 6,604 | 7,263 |
| Sierra | 0 | 480 | 1,953 | 2,343 | 4,776 |
| Siskiyou | 0 | 0 | 997 | 0 | 997 |
| Six Rivers | 0 | 37 | 2,433 | 2,410 | 4,880 |
| Stanislaus | 2,747 | 18,318 | 27,692 | 21,809 | 70,566 |
| Tahoe | 20 | 817 | 1,210 | 3,481 | 5,528 |
| Toiyabe | 1,219 | 17 | 0 | 0 | 1,236 |
| Trinity | 244 | 4,302 | 2,131 | 2,187 | 8,864 |
| Subtotal | 5,002 | 47,781 | 65,883 | 57,370 | 176,036 |

See footnotes at end of table.

**Table 20–Reforestation needs as of October 1, 1991, by State, forest, and site productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Acres by site productivity class 2/ 0-49 | 50-84 | 85-119 | 120+ | Total acres |
|---|---|---|---|---|---|
| Colorado | | | | | |
| Arapaho and Roosevelt | 5,513 | 2,835 | 0 | 0 | 8,348 |
| Grand Mesa, Uncompahgre, and Gunnison | 5,198 | 2,267 | 137 | 0 | 7,602 |
| Pike and San Isabel | 1,795 | 748 | 0 | 0 | 2,543 |
| Rio Grande | 122 | 115 | 88 | 0 | 325 |
| Routt | 6,457 | 2,452 | 68 | 0 | 8,977 |
| San Juan | 1,577 | 2,662 | 136 | 0 | 4,375 |
| White River | 790 | 1,159 | 10 | 0 | 1,959 |
| Subtotal | 21,452 | 12,238 | 439 | 0 | 34,129 |
| Florida | | | | | |
| NFs in Florida (subtotal) | 13,752 | 4,725 | 1,369 | 777 | 20,623 |
| Georgia | | | | | |
| Chattahoochee and Oconee (subtotal) | 10 | 207 | 4,018 | 738 | 4,973 |
| Idaho | | | | | |
| Boise | 1,367 | 21,503 | 9,715 | 3,251 | 35,836 |
| Caribou | 0 | 0 | 28 | 0 | 28 |
| Challis | 0 | 450 | 0 | 0 | 450 |
| Clearwater | 6,626 | 567 | 3,939 | 8,470 | 19,602 |
| Idaho Panhandle | 16,197 | 2,089 | 8,404 | 6,645 | 33,335 |
| Kootenai | 123 | 40 | 65 | 20 | 248 |
| Lolo | 0 | 0 | 0 | 0 | 0 |
| Nez Perce | 2,548 | 2,419 | 7,571 | 3,870 | 16,408 |
| Payette | 1,292 | 2,976 | 5,312 | 24 | 9,604 |
| Salmon | 3,561 | 3,313 | 0 | 0 | 6,874 |
| Sawtooth | 227 | 250 | 0 | 0 | 477 |
| Targhee | 428 | 13,963 | 0 | 56 | 14,447 |
| Subtotal | 32,369 | 47,570 | 35,034 | 22,336 | 137,309 |
| Illinois | | | | | |
| Shawnee (subtotal) | 0 | 533 | 133 | 17 | 683 |
| Indiana | | | | | |
| Hoosier (subtotal) | 0 | 0 | 1,147 | 590 | 1,737 |
| Kentucky | | | | | |
| Daniel Boone (subtotal) | 24 | 3,517 | 1,806 | 273 | 5,620 |
| Louisiana | | | | | |
| Kisatchie (subtotal) | 9 | 1,313 | 2 | 5,529 | 6,853 |
| Maine | | | | | |
| White Mountain (subtotal) | 37 | 17 | 45 | 12 | 111 |
| Michigan | | | | | |
| Hiawatha | 1,527 | 870 | 17 | 61 | 2,475 |
| Huron-Manistee | 3,693 | 3,354 | 674 | 25 | 7,746 |
| Ottawa | 1,859 | 10,064 | 577 | 116 | 12,616 |
| Subtotal | 7,079 | 14,288 | 1,268 | 202 | 22,837 |

See footnotes at end of table.

**Table 20–Reforestation needs as of October 1, 1991, by State, forest, and site productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Acres by site productivity class 2/ 0-49 | 50-84 | 85-119 | 120+ | Total acres |
|---|---|---|---|---|---|
| Minnesota | | | | | |
| Chippewa | 272 | 0 | 138 | 47 | 457 |
| Superior | 293 | 1,925 | 547 | 172 | 2,937 |
| Subtotal | 565 | 1,925 | 685 | 219 | 3,394 |
| Mississippi | | | | | |
| NFs in Mississippi (subtotal) | 219 | 2,945 | 5,165 | 7,812 | 16,141 |
| Missouri | | | | | |
| Mark Twain (subtotal) | 0 | 13,130 | 84 | 0 | 13,214 |
| Montana | | | | | |
| Beaverhead | 1,242 | 1,189 | 20 | 0 | 2,451 |
| Bitterroot | 2,618 | 1,173 | 462 | 14 | 4,267 |
| Custer | 4,014 | 590 | 192 | 0 | 4,796 |
| Deerlodge | 2,239 | 422 | 647 | 0 | 3,308 |
| Flathead | 13,718 | 1,363 | 3,202 | 721 | 19,004 |
| Gallatin | 1,306 | 1,680 | 21 | 8 | 3,015 |
| Helena | 5,510 | 446 | 328 | 0 | 6,284 |
| Kootenai | 16,501 | 5,042 | 8,495 | 1,933 | 31,971 |
| Lewis and Clark | 1,371 | 709 | 83 | 0 | 2,163 |
| Lolo | 8,279 | 4,831 | 2,029 | 294 | 15,433 |
| Subtotal | 56,798 | 17,445 | 15,479 | 2,970 | 92,692 |
| New Hampshire | | | | | |
| White Mountain (subtotal) | 1,745 | 3,445 | 959 | 235 | 6,384 |
| New Mexico | | | | | |
| Carson | 1,218 | 229 | 0 | 0 | 1,447 |
| Cibola | 980 | 35 | 0 | 0 | 1,015 |
| Gila | 9 | 0 | 0 | 0 | 9 |
| Lincoln | 19 | 2,162 | 8 | 0 | 2,189 |
| Santa Fe | 2,562 | 10 | 0 | 0 | 2,572 |
| Subtotal | 4,788 | 2,436 | 8 | 0 | 7,232 |
| New York | | | | | |
| Green Mountain (subtotal) | 0 | 0 | 69 | 8 | 77 |
| North Carolina | | | | | |
| NFs in North Carolina (subtotal) | 427 | 2,600 | 181 | 357 | 3,565 |
| Ohio | | | | | |
| Wayne (subtotal) | 0 | 224 | 1,025 | 1,339 | 2,588 |
| Oklahoma | | | | | |
| Ouachita (subtotal) | 0 | 997 | 341 | 602 | 1,940 |
| Oregon | | | | | |
| Deschutes | 10,252 | 10,546 | 632 | 155 | 21,585 |
| Fremont | 6,158 | 1,839 | 634 | 0 | 8,631 |
| Klamath | 10 | 62 | 74 | 156 | 302 |
| Malheur | 2,784 | 24,202 | 0 | 0 | 26,986 |
| Mt. Hood | 529 | 11,316 | 5,787 | 2,193 | 19,825 |
| Ochoco | 18002 | 4464 | 142 | 0 | 22,608 |
| Rogue River | 0 | 3,576 | 10,738 | 176 | 14,490 |
| Siskiyou | 0 | 88 | 3,166 | 1,336 | 4,590 |

See footnotes at end of table.

**Table 20–Reforestation needs as of October 1, 1991, by State, forest, and site productivity class--Continued**

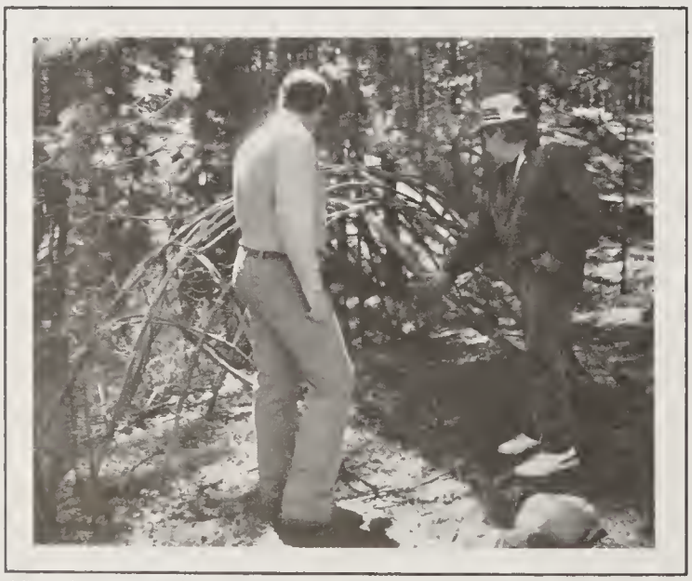
| State, Commonwealth, or Territory 1/ National Forest | Acres by site productivity class 2/ 0-49 | 50-84 | 85-119 | 120+ | Total acres |
|---|---|---|---|---|---|
| Siuslaw | 0 | 0 | 0 | 1,820 | 1,820 |
| Umatilla | 1,077 | 14,383 | 920 | 0 | 16,380 |
| Umpqua | 28 | 1,310 | 6,389 | 3,122 | 10,849 |
| Wallowa-Whitman | 11,550 | 33,052 | 9,522 | 40 | 54,164 |
| Willamette | 48 | 2,045 | 2,566 | 8,448 | 13,107 |
| Winema | 6,979 | 3,036 | 3,270 | 643 | 13,928 |
| Subtotal | 57,417 | 109,919 | 43,840 | 18,089 | 229,265 |
| Pennsylvania | | | | | |
| Allegheny (subtotal) | 3,879 | 2,377 | 0 | 0 | 6,256 |
| Puerto Rico | | | | | |
| Caribbean (subtotal) | 0 | 0 | 41 | 118 | 159 |
| South Carolina | | | | | |
| Francis Marion and Sumter (subtotal) | 392 | 6,428 | 17,187 | 44,509 | 68,516 |
| South Dakota | | | | | |
| Black Hills (subtotal) | 20,463 | 6,323 | 0 | 0 | 26,786 |
| Tennessee | | | | | |
| Cherokee (subtotal) | 44 | 1,869 | 1,441 | 4,683 | 8,037 |
| Texas | | | | | |
| NFs in Texas (subtotal) | 0 | 4,738 | 6,256 | 1,250 | 12,244 |
| Utah | | | | | |
| Ashley | 14,063 | 756 | 0 | 0 | 14,819 |
| Dixie | 833 | 1,776 | 0 | 0 | 2,609 |
| Fishlake | 0 | 567 | 0 | 0 | 567 |
| Manti-LaSal | 0 | 490 | 100 | 0 | 590 |
| Uinta | 0 | 0 | 83 | 0 | 83 |
| Wasatch-Cache | 465 | 509 | 0 | 0 | 974 |
| Subtotal | 15,361 | 4,098 | 183 | 0 | 19,642 |
| Vermont | | | | | |
| Green Mountain (subtotal) | 0 | 426 | 296 | 0 | 722 |
| Virginia | | | | | |
| George Washington | 1,455 | 66 | 100 | 274 | 1,895 |
| Jefferson | 255 | 2,897 | 214 | 144 | 3,510 |
| Subtotal | 1,710 | 2,963 | 314 | 418 | 5,405 |
| Washington | | | | | |
| Colville | 2,750 | 9,459 | 3,319 | 247 | 15,775 |
| Gifford Pinchot | 0 | 3,257 | 8,936 | 1,899 | 14,092 |
| Idaho Panhandle | 214 | 0 | 1,162 | 89 | 1,465 |
| Mt. Baker-Snoqualmie | 0 | 694 | 1,588 | 627 | 2,909 |
| Okanogan | 4,104 | 5,200 | 1,494 | 0 | 10,798 |
| Olympic | 12 | 564 | 3,122 | 1,407 | 5,105 |
| Umatilla | 32 | 1,150 | 209 | 0 | 1,391 |
| Wenatchee | 505 | 2,031 | 4,346 | 88 | 6,970 |
| Subtotal | 7,617 | 22,355 | 24,176 | 4,357 | 58,505 |

See footnotes at end of table.

**Table 20–Reforestation needs as of October 1, 1991, by State, forest, and site productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Acres by site productivity class 2/ 0-49 | 50-84 | 85-119 | 120+ | Total acres |
|---|---|---|---|---|---|
| West Virginia | | | | | |
| George Washington | 159 | 20 | 123 | 230 | 532 |
| Jefferson | 0 | 0 | 0 | 0 | 0 |
| Monongahela | 50 | 696 | 824 | 300 | 1,870 |
| Subtotal | 209 | 716 | 947 | 530 | 2,402 |
| Wisconsin | | | | | |
| Chequamegon | 0 | 3,912 | 305 | 156 | 4,373 |
| Nicolet | 1,317 | 6,585 | 2,195 | 878 | 10,975 |
| Subtotal | 1,317 | 10,497 | 2,500 | 1,034 | 15,348 |
| Wyoming | | | | | |
| Bighorn | 2,732 | 419 | 0 | 0 | 3,151 |
| Black Hills | 7,433 | 8,332 | 38 | 0 | 15,803 |
| Bridger-Teton | 0 | 294 | 1,716 | 0 | 2,010 |
| Medicine Bow | 4,515 | 200 | 0 | 0 | 4,715 |
| Shoshone | 1,049 | 757 | 174 | 0 | 1,980 |
| Targhee | 0 | 167 | 0 | 0 | 167 |
| Wasatch | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 15,729 | 10,169 | 1,928 | 0 | 27,826 |
| Total | 280,643 | 375,777 | 249,762 | 206,375 | 1,112,557 |

1/ Site productivity class refers to the amount of wood produced in cubic feet per acre per year in a natural unmanaged stand.
2/ States not listed had no reforestation needs as of October 1, 1991.



*Historic sweatlodge on the Deerlodge National Forest in Montana.*
F.S. Photo

*Chief White Cloud, Chippewa National Forest, Minnesota, 1940.* Photo by Leland J Prater

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertili-zation | Pruning | Total |
| | | | | | *Acres* | | | | | *Acres* |
| Alabama | | | | | | | | | | |
| NFs in Alabama (subtotal) | 4,202 | 0 | 523 | 0 | 4,725 | 1,496 | 0 | 0 | 0 | 1,496 |
| Alaska | | | | | | | | | | |
| Chugach | 0 | 0 | 0 | 20 | 20 | 0 | 0 | 0 | 0 | 0 |
| Tongass-Chatham | 568 | 0 | 0 | 8,198 | 8,766 | 0 | 272 | 0 | 0 | 272 |
| Tongass-Ketchikan | 0 | 0 | 0 | 7,495 | 7,495 | 0 | 0 | 0 | 0 | 0 |
| Tongass-Stikine | 275 | 0 | 0 | 1,402 | 1,677 | 0 | 1,352 | 0 | 0 | 1,352 |
| Subtotal | 843 | 0 | 0 | 17,115 | 17,958 | 0 | 1,624 | 0 | 0 | 1,624 |
| Arizona | | | | | | | | | | |
| Apache-Sitgreaves | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 25 |
| Coconino | 28 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 |
| Kaibab | 0 | 0 | 0 | 0 | 0 | 0 | 585 | 0 | 0 | 585 |
| Tonto | 38 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 66 | 0 | 0 | 0 | 66 | 0 | 610 | 0 | 0 | 610 |
| Arkansas | | | | | | | | | | |
| Ouachita | 12,257 | 10 | 535 | 307 | 13,109 | 4,837 | 569 | 0 | 0 | 5,406 |
| Ozark-St. Francis | 2,098 | 0 | 3,100 | 130 | 5,328 | 1,691 | 299 | 0 | 0 | 1,990 |
| Subtotal | 14,355 | 10 | 3,635 | 437 | 18,437 | 6,528 | 868 | 0 | 0 | 7,396 |
| California | | | | | | | | | | |
| Angeles | 0 | 0 | 55 | 0 | 55 | 0 | 0 | 0 | 0 | 0 |
| Cleveland | 15 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 |
| Eldorado | 191 | 0 | 0 | 0 | 191 | 3,695 | 354 | 0 | 0 | 4,049 |
| Klamath | 2,474 | 0 | 0 | 0 | 2,474 | 28 | 0 | 0 | 0 | 28 |
| Lassen | 0 | 0 | 0 | 0 | 0 | 0 | 391 | 0 | 0 | 391 |
| Mendocino | 141 | 0 | 0 | 0 | 141 | 256 | 0 | 0 | 0 | 256 |
| Plumas | 627 | 0 | 0 | 0 | 627 | 85 | 0 | 0 | 0 | 85 |
| Sequoia | 724 | 0 | 0 | 0 | 724 | 0 | 0 | 0 | 0 | 0 |
| Shasta | 4,702 | 0 | 0 | 2 | 4,704 | 734 | 189 | 0 | 0 | 923 |
| Sierra | 764 | 0 | 0 | 0 | 764 | 0 | 0 | 0 | 0 | 0 |
| Siskiyou | 127 | 0 | 0 | 0 | 127 | 0 | 0 | 0 | 0 | 0 |
| Six Rivers | 534 | 0 | 7 | 46 | 587 | 30 | 285 | 0 | 0 | 315 |
| Stanislaus | 0 | 0 | 24 | 0 | 24 | 217 | 0 | 0 | 0 | 217 |
| Tahoe | 621 | 0 | 0 | 260 | 881 | 690 | 107 | | | 797 |
| Trinity | 4,475 | 0 | 0 | 0 | 4,475 | 2,670 | 517 | 0 | 0 | 3,187 |
| Subtotal | 15,395 | 0 | 86 | 308 | 15,789 | 8,405 | 1,843 | 0 | 0 | 10,248 |

See footnotes at end of table.

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertili-zation | Pruning | Total |
| | | | | | *Acres* | | | | | *Acres* |
| Colorado | | | | | | | | | | |
| Arapaho and Roosevelt | 0 | 0 | 108 | 2,223 | 2,331 | 274 | 254 | 0 | 0 | 528 |
| Grand Mesa, Uncompahgre, and Gunnison | 1,093 | 144 | 297 | 972 | 2,506 | 0 | 388 | 24 | 0 | 412 |
| Pike and San Isabel | 0 | 0 | 14 | 335 | 349 | 62 | 22 | 0 | 0 | 84 |
| Rio Grande | 0 | 0 | 0 | 104 | 104 | 0 | 60 | 0 | 0 | 60 |
| Routt | 29 | 197 | 30 | 1,740 | 1,996 | 68 | 71 | 0 | 0 | 139 |
| San Juan | 597 | 0 | 85 | 216 | 898 | 0 | 192 | 0 | 0 | 192 |
| White River | 0 | 0 | 88 | 2,810 | 2,898 | 1,672 | 129 | 0 | 0 | 1,801 |
| Subtotal | 1,719 | 341 | 622 | 8,400 | 11,082 | 2,076 | 1,116 | 24 | 0 | 3,216 |
| Florida | | | | | | | | | | |
| NFs in Florida (subtotal) | 10,020 | 7,790 | 195 | 327 | 18,332 | 0 | 207 | 3,401 | 0 | 3,608 |
| Georgia | | | | | | | | | | |
| Chattahoochee-Oconee (subtotal) | 4,132 | 0 | 1,268 | 0 | 5,400 | 5,409 | 32 | 299 | 3 | 5,743 |
| Idaho | | | | | | | | | | |
| Boise | 2,633 | 0 | 110 | 120 | 2,863 | 97 | 2,583 | 0 | 0 | 2,680 |
| Caribou | 0 | 0 | 0 | 0 | 0 | 0 | 456 | 0 | 0 | 456 |
| Clearwater | 918 | 0 | 0 | 262 | 1,180 | 304 | 533 | 0 | 107 | 944 |
| Idaho Panhandle | 4,134 | 0 | 295 | 705 | 5,134 | 1,163 | 2,540 | 310 | 236 | 4,249 |
| Lolo | 12 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 |
| Nez Perce | 3,583 | 0 | 168 | 666 | 4,417 | 112 | 899 | 0 | 0 | 1,011 |
| Payette | 0 | 0 | 0 | 0 | 0 | 80 | 2,503 | 0 | 0 | 2,583 |
| Salmon | 409 | 0 | 0 | 406 | 815 | 217 | 402 | 0 | 0 | 619 |
| Targhee | 638 | 0 | 3,598 | 0 | 4,236 | 0 | 641 | 0 | 0 | 641 |
| Subtotal | 12,327 | 0 | 4,171 | 2,159 | 18,657 | 1,973 | 10,557 | 310 | 343 | 13,183 |
| Indiana | | | | | | | | | | |
| Wayne-Hoosier (subtotal) | 0 | 0 | 165 | 0 | 165 | 191 | 0 | 0 | 0 | 191 |
| Kentucky | | | | | | | | | | |
| Daniel Boone (subtotal) | 1,483 | 0 | 6,173 | 0 | 7,656 | 3,608 | 1,140 | 0 | 72 | 4,820 |
| Louisiana | | | | | | | | | | |
| Kisatchie (subtotal) | 7,832 | 0 | 27 | 300 | 8,159 | 1,504 | 288 | 0 | 0 | 1,792 |
| Maine | | | | | | | | | | |
| White Mountain (subtotal) | 0 | 0 | 277 | 101 | 378 | 35 | 0 | 0 | 0 | 35 |

See footnotes at end of table.

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertili-zation | Pruning | Total |
| | | | | | *Acres* | | | | | *Acres* |
| Michigan | | | | | | | | | | |
| Hiawatha | 536 | 76 | 2,398 | 404 | 3,414 | 1,142 | 351 | 0 | 596 | 2,089 |
| Huron-Manistee | 1,189 | 0 | 4,093 | 739 | 6,021 | 347 | 42 | 0 | 14 | 403 |
| Ottawa | 335 | 15 | 2,517 | 2522 | 5,389 | 869 | 0 | 0 | 0 | 869 |
| Subtotal | 2,060 | 91 | 9,008 | 3,665 | 14,824 | 2,358 | 393 | 0 | 610 | 3,361 |
| Minnesota | | | | | | | | | | |
| Chippewa | 598 | 96 | 4,926 | 239 | 5,859 | 399 | 0 | 0 | 59 | 458 |
| Superior | 427 | 124 | 2,743 | 2,898 | 6,192 | 922 | 0 | 0 | 0 | 922 |
| Subtotal | 1,025 | 220 | 7,669 | 3,137 | 12,051 | 1,321 | 0 | 0 | 59 | 1,380 |
| Mississippi | | | | | | | | | | |
| NFs in Mississippi (subtotal) | 11,496 | 378 | 857 | 0 | 12,731 | 3,447 | 628 | 809 | 0 | 4,884 |
| Missouri | | | | | | | | | | |
| Mark Twain (subtotal) | 1,593 | 0 | 7,718 | 65 | 9,376 | 2,161 | 2,973 | 0 | 0 | 5,134 |
| Montana | | | | | | | | | | |
| Beaverhead | 669 | 0 | 2,017 | 966 | 3,652 | 0 | 350 | 0 | 0 | 350 |
| Bitterroot | 4,402 | 0 | 411 | 817 | 5,630 | 261 | 713 | 0 | 0 | 974 |
| Custer | 0 | 0 | 0 | 21 | 21 | 509 | 0 | 0 | 0 | 509 |
| Deerlodge | 324 | 0 | 18 | 40 | 382 | 0 | 234 | 0 | 0 | 234 |
| Flathead | 1,076 | 0 | 27 | 49 | 1,152 | 509 | 2,322 | 0 | 0 | 2,831 |
| Gallatin | 1,125 | 0 | 150 | 374 | 1,649 | 35 | 510 | 0 | 0 | 545 |
| Helena | 641 | 73 | 39 | 285 | 1,038 | 85 | 312 | 0 | 0 | 397 |
| Kootenai | 1,215 | 0 | 582 | 2,323 | 4,120 | 0 | 2,864 | 0 | 0 | 2,864 |
| Lewis and Clark | 167 | 0 | 462 | 55 | 684 | 5 | 384 | 0 | 0 | 389 |
| Lolo | 3,082 | 0 | 803 | 547 | 4,432 | 98 | 789 | 0 | 0 | 887 |
| Subtotal | 12,701 | 73 | 4,509 | 5,477 | 22,760 | 1,502 | 8,478 | 0 | 0 | 9,980 |
| New Hampshire | | | | | | | | | | |
| White Mountain (subtotal) | 484 | 0 | 1,562 | 516 | 2,562 | 149 | 0 | 0 | 0 | 149 |

See footnotes at end of table.

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertilization | Pruning | Total |
| | | | | | *Acres* | | | | | *Acres* |
| New Mexico | | | | | | | | | | |
| Carson | 44 | 0 | 0 | 0 | 44 | 0 | 2,155 | 0 | 0 | 2,155 |
| Cibola | 1,068 | 0 | 0 | 60 | 1,128 | 0 | 0 | 0 | 0 | 0 |
| Gila | 0 | 0 | 42 | 554 | 596 | 0 | 0 | 0 | 0 | 0 |
| Lincoln | 43 | 40 | 0 | 185 | 268 | 0 | 393 | 0 | 0 | 393 |
| Santa Fe | 764 | 0 | 0 | 0 | 764 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 1,919 | 40 | 42 | 799 | 2,800 | 0 | 2,548 | 0 | 0 | 2,548 |
| North Carolina | | | | | | | | | | |
| NFs in North Carolina (subtotal) | 2,104 | 0 | 3,140 | 0 | 5,244 | 2,597 | 521 | 183 | 0 | 3,301 |
| Ohio | | | | | | | | | | |
| Wayne-Hoosier (subtotal) | 339 | 0 | 472 | 0 | 811 | 21 | 0 | 0 | 0 | 21 |
| Oklahoma | | | | | | | | | | |
| Ouachita (subtotal) | 1,824 | 0 | 0 | 71 | 1,895 | 97 | 3,751 | 0 | 0 | 3,848 |
| Oregon | | | | | | | | | | |
| Deschutes | 9,676 | 0 | 300 | 56 | 10,032 | 0 | 7,122 | 0 | 2,006 | 9,128 |
| Fremont | 10,084 | 0 | 0 | 0 | 10,084 | 0 | 4,170 | 0 | 0 | 4,170 |
| Klamath | 162 | 0 | 0 | 0 | 162 | 0 | 0 | 0 | 0 | 0 |
| Malheur | 254 | 0 | 44 | 513 | 811 | 0 | 10,469 | 0 | 0 | 10,469 |
| Mt. Hood | 4,180 | 0 | 0 | 86 | 4,266 | 55 | 4,542 | 5,211 | 8 | 9,816 |
| Ochoco | 1,290 | 0 | 0 | 0 | 1,290 | 0 | 0 | 0 | 0 | 0 |
| Rogue River | 2,854 | 0 | 0 | 158 | 3,012 | 1,452 | 588 | 0 | 0 | 2,040 |
| Siskiyou | 5,927 | 0 | 190 | 28 | 6,145 | 731 | 1,243 | 1,250 | 0 | 3,224 |
| Siuslaw | 5,378 | 0 | 0 | 0 | 5,378 | 4,850 | 2,558 | 2,687 | 85 | 10,180 |
| Umatilla | 1,765 | 0 | 245 | 1,022 | 3,032 | 0 | 738 | 0 | 0 | 738 |
| Umpqua | 6,729 | 0 | 0 | 168 | 6,897 | 202 | 2,569 | 5,033 | 0 | 7,804 |
| Wallowa-Whitman | 1,019 | 0 | 569 | 440 | 2,028 | 0 | 1,200 | 0 | 0 | 1,200 |
| Willamette | 13,050 | 0 | 0 | 111 | 13,161 | 696 | 6,732 | 5,657 | 219 | 13,304 |
| Subtotal | 62,368 | 0 | 1,348 | 2,582 | 66,298 | 7,986 | 41,931 | 19,838 | 2,318 | 72,073 |
| Pennsylvania | | | | | | | | | | |
| Allegheny (subtotal) | 0 | 0 | 1,766 | 1,609 | 3,375 | 0 | 0 | 0 | 0 | 0 |
| South Carolina | | | | | | | | | | |
| Francis Marion and Sumter (subtotal) | 4,591 | 0 | 951 | 0 | 5,542 | 4,495 | 1,760 | 288 | 0 | 6,543 |

See footnotes at end of table.

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertili-zation | Pruning | Total |
| South Dakota | | | | | | | | | | |
| Black Hills (subtotal) | 0 | 0 | 0 | 9,988 | 9,988 | 0 | 10,712 | 0 | 0 | 10,712 |
| Tennessee | | | | | | | | | | |
| Cherokee (subtotal) | 1,403 | 0 | 472 | 0 | 1,875 | 758 | 0 | 0 | 0 | 758 |
| Texas | | | | | | | | | | |
| NFs in Texas (subtotal) | 7,155 | 0 | 1,116 | 847 | 9,118 | 0 | 725 | 0 | 0 | 725 |
| Utah | | | | | | | | | | |
| Ashley | 0 | 0 | 2,882 | 0 | 2,882 | 340 | 625 | 0 | 0 | 965 |
| Dixie | 0 | 0 | 0 | 0 | 0 | 0 | 1,166 | 0 | 0 | 1,166 |
| Uinta | 0 | 0 | 0 | 0 | 0 | 0 | 205 | 0 | 0 | 205 |
| Wasatch | 0 | 0 | 27 | 0 | 27 | 80 | 222 | 0 | 0 | 302 |
| Subtotal | 0 | 0 | 2,909 | 0 | 2,909 | 420 | 2,218 | 0 | 0 | 2,638 |
| Virginia | | | | | | | | | | |
| George Washington | 858 | 0 | 1,969 | 0 | 2,827 | 819 | 0 | 0 | 0 | 819 |
| Jefferson | 366 | 0 | 1,739 | | 2,105 | 287 | 423 | 0 | 10 | 720 |
| Subtotal | 1,224 | 0 | 3,708 | 0 | 4,932 | 1,106 | 423 | 0 | 10 | 1,539 |
| Washington | | | | | | | | | | |
| Colville | 3,527 | 0 | 0 | 152 | 3,679 | 0 | 1,465 | 0 | 0 | 1,465 |
| Gifford Pinchot | 12,112 | 0 | 0 | 398 | 12,510 | 316 | 6,086 | 0 | 936 | 7,338 |
| Idaho Panhandle | 89 | 0 | 0 | 42 | 131 | 0 | 70 | 0 | 0 | 70 |
| Mt. Baker-Snoqualmie | 2,874 | 0 | 0 | 462 | 3,336 | 0 | 265 | 0 | 0 | 265 |
| Okanogan | 990 | 0 | 212 | 538 | 1,740 | 0 | 0 | 0 | 0 | 0 |
| Olympic | 3,936 | 0 | 92 | 492 | 4,520 | 163 | 2,063 | 4,195 | 0 | 6,421 |
| Umatilla | 614 | 0 | 24 | 0 | 638 | 0 | 17 | 0 | 38 | 55 |
| Wenatchee | 1,800 | 0 | 31 | 1,658 | 3,489 | 0 | 459 | 0 | 30 | 489 |
| Subtotal | 25,942 | 0 | 359 | 3,742 | 30,043 | 479 | 10,425 | 4,195 | 1,004 | 16,103 |
| West Virginia | | | | | | | | | | |
| George Washington | 125 | 0 | 433 | 0 | 558 | 601 | 0 | 0 | 0 | 601 |
| Monongahela | 0 | 0 | 1,646 | 639 | 2,285 | 417 | 0 | 0 | 0 | 417 |
| Subtotal | 125 | 0 | 2,079 | 639 | 2,843 | 1,018 | 0 | 0 | 0 | 1,018 |

See footnotes at end of table.

**Table 21–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ National Forest | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Artificial regeneration | | Natural regeneration | | | | | | | |
| | Planted | Seeded | w/site prep. 2/ | w/o site prep. 2/ | Total | Release | Thinning | Fertili-zation | Pruning | Total |
| | | | | | *Acres* | | | | | *Acres* |
| Wisconsin | | | | | | | | | | |
| Chequamegon | 194 | 0 | 919 | 104 | 1,217 | 15 | 0 | 0 | 0 | 15 |
| Nicolet | 855 | 0 | 5,129 | 127 | 6,111 | 506 | 0 | 0 | 0 | 506 |
| Subtotal | 1,049 | 0 | 6,048 | 231 | 7,328 | 521 | 0 | 0 | 0 | 521 |
| Wyoming | | | | | | | | | | |
| Big Horn | 0 | 0 | 80 | 1,700 | 1,780 | 0 | 0 | 0 | 0 | 0 |
| Black Hills | 0 | 0 | 0 | 753 | 753 | 0 | 567 | 0 | 0 | 567 |
| Bridger-Teton | 1,315 | 0 | 0 | 0 | 1,315 | 0 | 0 | 0 | 0 | 0 |
| Medicine Bow | 0 | 0 | 2,411 | 719 | 3,130 | 152 | 1,064 | 0 | 0 | 1,216 |
| Targhee | 82 | 0 | 1,024 | 0 | 1,106 | 0 | 26 | 0 | 0 | 26 |
| Wasatch | 0 | 0 | 236 | 0 | 236 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 1,397 | 0 | 3,751 | 3,172 | 8,320 | 152 | 1,657 | 0 | 0 | 1,809 |
| Total | 213,173 | 8,943 | 76,626 | 65,687 | 364,429 | 61,813 | 107,428 | 29,347 | 4,419 | 203,007 |

1/ States not listed had no certification in fiscal year 1991.
2/ w/ site prep. = with site preparation; w/o site prep. = without site preparation.

**Table 22–Certification of reforestation and timber stand improvement acreages by Region--fiscal year 1991**

| Region | Reforestation | | | | | Timber stand improvement | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Natural regeneration | | | | | | | |
| | Planted | Seeded | With site preparation | Without site preparation | Total | Release | Precom-mercial thinning | Fertili-zation | Pruning | Total |
| | *Acres* | | | | | | | | | |
| Northern | 21,437 | 73 | 4,972 | 7,152 | 33,634 | 3,081 | 12,520 | 310 | 343 | 16,254 |
| Rocky Mountain | 1,719 | 341 | 3,113 | 21,560 | 26,733 | 2,228 | 13,459 | 24 | | 15,711 |
| Southwest | 1,985 | 40 | 42 | 799 | 2,866 | | 3,158 | | | 3,158 |
| Intermountain | 5,077 | | 7,877 | 526 | 13,480 | 814 | 8,829 | | | 9,643 |
| Pacific Southwest | 15,430 | | 86 | 308 | 15,824 | 8,405 | 1,843 | | | 10,248 |
| Pacific Northwest | 88,186 | | 1,707 | 6,282 | 96,175 | 8,465 | 52,286 | 24,033 | 3,322 | 88,106 |
| Southern | 71,946 | 8,178 | 22,498 | 1,982 | 104,604 | 31,646 | 10,343 | 4,980 | 85 | 47,054 |
| Eastern | 6,550 | 311 | 36,331 | 9,963 | 53,155 | 7,174 | 3,366 | | 669 | 11,209 |
| Alaska | 843 | | | 17,115 | 17,958 | | 1,624 | | | 1,624 |
| Total | 213,173 | 8,943 | 76,626 | 65,687 | 364,429 | 61,813 | 107,428 | 29,347 | 4,419 | 203,007 |

**Table 23–Timber stand improvement funding and accomplishments by funding source--fiscal yars 1987-91**

| | Appropriated | Knutson-Vandenberg | Total |
|---|---|---|---|
| 1987 | | | |
| Million dollars 1/ | 31.8 | 32.8 2/ | 64.6 |
| 1,000 acres | 222.7 3/ | 134.2 | 356.9 3/ |
| Constant dollars/acre | 142.8 | 244.4 | 181.0 4/ |
| 1988 | | | |
| Million dollars 1/ | 26.1 | 34.9 5/ | 61.0 5/ |
| 1,000 acres | 199.0 | 138.2 | 337.2 |
| Constant dollars/acre | 131.2 | 252.5 | 180.9 5/ |
| 1989 | | | |
| Million dollars 1/ | 34.8 | 38.1 5/ | 72.9 |
| 1,000 acres | 196.9 6/ | 146.1 | 343.0 |
| Constant dollars/acre | 176.7 | 260.8 | 212.5 |
| 1990 | | | |
| Million dollars 1/ | 31.0 | 31.5 | 62.5 |
| 1,000 acres | 200.3 7/ | 166.6 | 366.9 |
| Constant dollars/acre | 154.8 | 189.1 | 170.3 |
| 1991 | | | |
| Million dollars 1/ | 32.0 | 23.5 | 55.5 |
| 1,000 acres | 226.4 | 167.3 | 393.7 8/ |
| Constant dollars/acre | 141.3 | 140.5 | 141.0 |

1/ All dollars are constant 1991. Does not include funds for nursery and tree improvement.
2/ Although $30.3 million had been authorized, only $20.9 million were obligated and the cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.
3/ Accomplishments and costs include the $3.4 million and 8,431 acres done with Tongass timber funds.
4/ Weighted average.
5/ Although $34.9 million had been authorized, only $25.6 million were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.
6/ Does not include 2.314 acres in Tongass Timber Supply fund.
7/ Includes 3,346 acres performed with carryover TSI funds.
8/ Does not include 2,127 acres accomplished with contributed funding.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertilization subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Alabama | | | | | | | | | |
| NFs in Alabama (subtotal) | 180 | 2,969 | 3,154 | 514 | 6,817 | 6,742 | 75 | 0 | 0 |
| Alaska | | | | | | | | | |
| Chugach | 0 | 26 | 374 | 0 | 400 | 0 | 400 | 0 | 0 |
| Tongass-Chatham | 0 | 0 | 1,789 | 9,074 | 10,863 | 1,812 | 9,051 | 0 | 0 |
| Tongass-Ketchikan | 0 | 0 | 0 | 34,236 | 34,236 | 987 | 33,249 | 0 | 0 |
| Tongass-Stikine | 30 | 10 | 455 | 11,322 | 11,817 | 0 | 11,817 | 0 | 0 |
| Subtotal | 30 | 36 | 2,618 | 54,632 | 57,316 | 2,799 | 54,517 | 0 | 0 |
| Arizona | | | | | | | | | |
| Apache-Sitgreaves | 770 | 2,713 | 0 | 0 | 3,483 | 0 | 3,483 | 0 | 0 |
| Coconino | 3,398 | 738 | 0 | 0 | 4,136 | 0 | 4,136 | 0 | 0 |
| Kaibab | 771 | 402 | 0 | 0 | 1,173 | 0 | 1,173 | 0 | 0 |
| Tonto | 8 | 0 | 0 | 0 | 8 | 0 | 8 | 0 | 0 |
| Subtotal | 4,947 | 3,853 | 0 | 0 | 8,800 | 0 | 8,800 | 0 | 0 |
| Arkansas | | | | | | | | | |
| Ouachita | 1,043 | 6,411 | 326 | 100 | 7,880 | 3,967 | 3,913 | 0 | 0 |
| Ozark-St. Francis | 232 | 1,709 | 402 | 70 | 2,413 | 303 | 2,110 | 0 | 0 |
| Subtotal | 1,275 | 8,120 | 728 | 170 | 10,293 | 4,270 | 6,023 | 0 | 0 |
| California | | | | | | | | | |
| Angeles | 46 | 474 | 418 | 0 | 938 | 764 | 101 | 0 | 73 |
| Cleveland | 0 | 707 | 0 | 0 | 707 | 511 | 195 | 0 | 1 |
| Eldorado | 52 | 582 | 8,858 | 17,854 | 27,346 | 19,866 | 7,422 | 58 | 0 |
| Klamath | 310 | 16,411 | 23,177 | 14,861 | 54,759 | 41,831 | 12,905 | 23 | 0 |
| Lake Tahoe Basin | 800 | 2,172 | 3,335 | 30 | 6,337 | 3,513 | 2,824 | 0 | 0 |
| Lassen | 2,323 | 42,746 | 13,534 | 2,094 | 60,697 | 26,345 | 34,352 | 0 | 0 |
| Mendocino | 180 | 19,134 | 13,258 | 25,937 | 58,509 | 37,625 | 18,793 | 2,091 | 0 |
| Modoc | 195 | 12,769 | 3,752 | 1,375 | 18,091 | 6,633 | 11,382 | 76 | 0 |
| Plumas | 0 | 398 | 13,719 | 3,901 | 18,018 | 2,054 | 15,964 | 0 | 0 |
| Rogue River | 0 | 427 | 0 | 0 | 427 | 402 | 25 | 0 | 0 |
| San Bernardino | 276 | 2,509 | 161 | 66 | 3,012 | 1,211 | 1,766 | 0 | 35 |
| Sequoia | 25 | 2,537 | 1,822 | 8,993 | 13,377 | 10,763 | 1,819 | 672 | 123 |
| Shasta | 0 | 430 | 787 | 24,272 | 25,489 | 22,486 | 3,003 | 0 | 0 |
| Sierra | 139 | 1,287 | 6,014 | 10,364 | 17,804 | 13,587 | 4,207 | 10 | 0 |
| Siskiyou | 0 | 0 | 781 | 0 | 781 | 619 | 0 | 162 | 0 |
| Six Rivers | 0 | 156 | 8,390 | 16,451 | 24,997 | 16,785 | 8,158 | 54 | 0 |
| Stanislaus | 1,393 | 12,165 | 16,460 | 52,911 | 82,929 | 57,277 | 25,652 | 0 | 0 |

See footnotes at end of table.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertili-zation subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Tahoe | 63 | 4,318 | 14,751 | 29,685 | 48,817 | 24,072 | 24,382 | 363 | 0 |
| Toiyabe | 2,956 | 1,437 | 0 | 0 | 4,393 | 2,462 | 1,931 | 0 | 0 |
| Trinity | 415 | 12,596 | 12,718 | 9,463 | 35,192 | 15,300 | 19,892 | 0 | 0 |
| Subtotal | 9,173 | 133,255 | 141,935 | 218,257 | 502,620 | 304,106 | 194,773 | 3,509 | 232 |
| Colorado | | | | | | | | | |
| Arapaho-Roosevelt | 2,934 | 4,276 | 0 | 0 | 7,210 | 701 | 6,509 | 0 | 0 |
| Grand Mesa, Uncompahgre, and Gunnison | 3,299 | 399 | 0 | 0 | 0 3,698 | 871 | 2,827 | 0 | 0 |
| Manti-LaSal | 0 | 0 | 95 | 0 | 95 | 0 | 95 | 0 | 0 |
| Pike and San Isabel | 1,935 | 450 | 0 | 0 | 2,385 | 1,449 | 936 | 0 | 0 |
| Routt | 3,699 | 1,422 | 282 | 0 | 5,403 | 1,264 | 4,139 | 0 | 0 |
| San Juan | 2,068 | 1,132 | 49 | 0 | 3,249 | 3,053 | 196 | 0 | 0 |
| White River | 1,410 | 2,483 | 619 | 0 | 4,512 | 3,882 | 630 | 0 | 0 |
| Subtotal | 15,345 | 10,162 | 1,045 | 0 | 26,552 | 11,220 | 15,332 | 0 | 0 |
| Florida | | | | | | | | | |
| NFs in Florida (subtotal) | 598 | 1,402 | 817 | 41 | 2,858 | 249 | 404 | 2,205 | 0 |
| Georgia | | | | | | | | | |
| Chattahoochee and Oconee (subtotal) | 0 | 789 | 5,452 | 3,144 | 9,385 | 3,876 | 4,809 | 700 | 0 |
| Idaho | | | | | | | | | |
| Boise | 923 | 2,043 | 4,814 | 890 | 8,670 | 2,271 | 6,399 | 0 | 0 |
| Caribou | 0 | 1,032 | 47 | 0 | 1,079 | 692 | 387 | 0 | 0 |
| Challis | 0 | 433 | 0 | 0 | 433 | 133 | 300 | 0 | 0 |
| Clearwater | 2,244 | 136 | 1,163 | 2,238 | 5,781 | 1,277 | 4,457 | 0 | 47 |
| Idaho Panhandle | 5,692 | 2,864 | 12,099 | 10,291 | 30,946 | 4,956 | 24,599 | 1,391 | 0 |
| Kootenai | 68 | 0 | 149 | 49 | 266 | 99 | 167 | 0 | 0 |
| Nez Perce | 244 | 1,398 | 2,234 | 1,082 | 4,958 | 1,297 | 3,661 | 0 | 0 |
| Payette | 725 | 1,561 | 5,607 | 412 | 8,305 | 1,242 | 7,063 | 0 | 0 |
| Salmon | 3,636 | 3,139 | 0 | 0 | 6,775 | 3,281 | 3,494 | 0 | 0 |
| Sawtooth | 396 | 24 | 0 | 0 | 420 | 152 | 268 | 0 | 0 |
| Targhee | 5 | 783 | 0 | 0 | 788 | 608 | 180 | 0 | 0 |
| Subtotal | 13,933 | 13,413 | 26,113 | 14,962 | 68,421 | 16,008 | 50,975 | 1,391 | 47 |
| Illinois | | | | | | | | | |
| Shawnee (subtotal) | 0 | 50 | 4 | 0 | 54 | 1 | 0 | 0 | 53 |

See footnotes at end of table.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertilization subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Indiana | | | | | | | | | |
| Hoosier (subtotal) | 0 | 312 | 972 | 4,123 | 5,407 | 1,994 | 1,385 | 0 | 2,028 |
| Kentucky | | | | | | | | | |
| Daniel Boone (subtotal) | 40 | 2,355 | 5,395 | 626 | 8,416 | 2,542 | 5,785 | 3 | 86 |
| Louisiana | | | | | | | | | |
| Kisatchie (subtotal) | 4 | 328 | 2,006 | 1,212 | 3,550 | 2,389 | 1,161 | 0 | 0 |
| Maine | | | | | | | | | |
| White Mountain (subtotal) | 6 | 64 | 46 | 13 | 129 | 70 | 59 | 0 | 0 |
| Michigan | | | | | | | | | |
| Hiawatha | 828 | 2,551 | 2,570 | 28 | 5,977 | 1,353 | 882 | 0 | 3,742 |
| Huron-Manistee | 1,247 | 2,830 | 564 | 0 | 4,641 | 2,631 | 1,949 | 0 | 61 |
| Ottawa | 0 | 368 | 632 | 0 | 1,000 | 1,000 | 0 | 0 | 0 |
| Subtotal | 2,075 | 5,749 | 3,766 | 28 | 11,618 | 4,984 | 2,831 | 0 | 3,803 |
| Minnesota | | | | | | | | | |
| Chippewa | 0 | 59 | 802 | 43 | 904 | 480 | 0 | 0 | 424 |
| Superior | 3,714 | 0 | 0 | 38 | 3,752 | 3,752 | 0 | 0 | 0 |
| Subtotal | 3,714 | 59 | 802 | 81 | 4,656 | 4,232 | 0 | 0 | 424 |
| Mississippi | | | | | | | | | |
| NFs in Mississippi (subtotal) | 585 | 1,268 | 1,784 | 5,018 | 8,655 | 5,731 | 2,113 | 811 | 0 |
| Missouri | | | | | | | | | |
| Mark Twain (subtotal) | 0 | 6,471 | 221 | 0 | 6,692 | 1,529 | 5,078 | 0 | 85 |
| Montana | | | | | | | | | |
| Beaverhead | 3,151 | 1,105 | 517 | 38 | 4,811 | 555 | 4,256 | 0 | 0 |
| Bitterroot | 1,604 | 484 | 514 | 70 | 2,672 | 849 | 1,823 | 0 | 0 |
| Custer | 1,919 | 5 | 25 | 0 | 1,949 | 991 | 958 | 0 | 0 |
| Deerlodge | 6,640 | 1,260 | 174 | 8 | 8,082 | 1,148 | 6,934 | 0 | 0 |
| Flathead | 2,232 | 3,904 | 9,217 | 3,109 | 18,462 | 857 | 17,521 | 66 | 18 |
| Gallatin | 310 | 656 | 190 | 24 | 1,180 | 52 | 1,128 | 0 | 0 |
| Helena | 2,302 | 406 | 560 | 0 | 3,268 | 270 | 2,988 | 10 | 0 |
| Idaho Panhandle | 10 | 0 | 95 | 48 | 153 | 10 | 143 | 0 | 0 |

See footnotes at end of table.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertilization subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Kootenai | 3,400 | 6,496 | 19,801 | 7,395 | 37,092 | 1,011 | 35,955 | 0 | 126 |
| Lewis and Clark | 1,050 | 1,177 | 825 | 0 | 3,052 | 67 | 2,985 | 0 | 0 |
| Lolo | 1,277 | 2,834 | 2,910 | 583 | 7,604 | 192 | 7,405 | 0 | 7 |
| Subtotal | 23,895 | 18,327 | 34,828 | 11,275 | 88,325 | 6,002 | 82,096 | 76 | 151 |
| New Hampshire | | | | | | | | | |
| White Mountain (subtotal) | 111 | 121 | 125 | 24 | 381 | 74 | 307 | 0 | 0 |
| New Mexico | | | | | | | | | |
| Carson | 1,950 | 381 | 0 | 0 | 2,331 | 1,091 | 1,240 | 0 | 0 |
| Cibola | 871 | 0 | 0 | 0 | 871 | 698 | 173 | 0 | 0 |
| Lincoln | 0 | 3,579 | 0 | 0 | 3,579 | 0 | 3,579 | 0 | 0 |
| Santa Fe | 5,061 | 232 | 0 | 0 | 5,293 | 308 | 4,985 | 0 | 0 |
| Subtotal | 7,882 | 4,192 | 0 | 0 | 12,074 | 2,097 | 9,977 | 0 | 0 |
| New York | | | | | | | | | |
| Green Mountain (subtotal) | 0 | 136 | 719 | 0 | 855 | 60 | 795 | 0 | 0 |
| North Carolina | | | | | | | | | |
| NFs in North Carolina (subtotal) | 435 | 3,254 | 995 | 3,420 | 8,104 | 5,871 | 1,473 | 760 | 0 |
| Ohio | | | | | | | | | |
| Wayne (subtotal) | 26 | 583 | 669 | 2,508 | 3,786 | 1,180 | 1,261 | 0 | 1,345 |
| Oklahoma | | | | | | | | | |
| Ouachita (subtotal) | 0 | 581 | 204 | 51 | 836 | 433 | 403 | 0 | 0 |
| Oregon | | | | | | | | | |
| Deschutes | 3,046 | 4,839 | 489 | 71 | 8,445 | 751 | 7,694 | 0 | 0 |
| Fremont | 16,963 | 7,375 | 2,130 | 0 | 26,468 | 5,851 | 20,617 | 0 | 0 |
| Klamath | 12 | 357 | 748 | 1,231 | 2,348 | 1,267 | 1,081 | 0 | 0 |
| Malheur | 5,090 | 12,422 | 0 | 0 | 17,512 | 568 | 16,944 | 0 | 0 |
| Mt. Hood | 308 | 6,864 | 19,256 | 4,018 | 30,446 | 606 | 16,657 | 11,847 | 1,336 |
| Ochoco | 8,045 | 5,151 | 12 | 0 | 13,208 | 170 | 12,410 | 0 | 628 |
| Rogue River | 0 | 7,181 | 30,087 | 1,767 | 39,035 | 28,660 | 5,634 | 4,741 | 0 |
| Siskiyou | 0 | 2,075 | 28,267 | 6,471 | 36,813 | 17,234 | 14,705 | 4,697 | 177 |
| Siuslaw | 0 | 0 | 0 | 8,913 | 8,913 | 4,509 | 3,574 | 602 | 228 |
| Umatilla | 1,554 | 1,374 | 0 | 0 | 2,928 | 155 | 2,698 | 0 | 75 |
| Umpqua | 0 | 4,785 | 23,792 | 6,778 | 35,355 | 4,381 | 15,336 | 15,638 | 0 |
| Wallowa-Whitman | 1,027 | 6,465 | 1,583 | 0 | 9,075 | 3,865 | 5,210 | 0 | 0 |

See footnotes at end of table.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertilization subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Willamette | 0 | 1,528 | 18,472 | 22,041 | 42,041 | 3,349 | 13,860 | 19,957 | 4,875 |
| Winema | 18,759 | 5,439 | 317 | 2 | 24,517 | 1,030 | 23,287 | 0 | 200 |
| Subtotal | 54,804 | 65,855 | 125,153 | 51,292 | 297,104 | 72,396 | 159,707 | 57,482 | 7,519 |
| Puerto Rico | | | | | | | | | |
| Caribbean (subtotal) | 0 | 300 | 319 | 0 | 619 | 19 | 600 | 0 | 0 |
| South Carolina | | | | | | | | | |
| Francis Marion & Sumter (subtotal) | 0 | 40 | 3,215 | 1,182 | 4,437 | 1,608 | 550 | 2,279 | 0 |
| South Dakota | | | | | | | | | |
| Black Hills | 3,186 | 307 | 0 | 0 | 3,493 | 0 | 3,493 | 0 | 0 |
| Custer | 30 | 0 | 0 | 0 | 30 | 0 | 30 | 0 | 0 |
| Subtotal | 3,216 | 307 | 0 | 0 | 3,523 | 0 | 3,523 | 0 | 0 |
| Tennessee | | | | | | | | | |
| Cherokee (subtotal) | 38 | 2,465 | 1,306 | 2,251 | 6,060 | 5,209 | 851 | 0 | 0 |
| Texas | | | | | | | | | |
| NFs in Texas (subtotal) | 0 | 922 | 2,343 | 1,966 | 5,231 | 4,077 | 1,154 | 0 | 0 |
| Utah | | | | | | | | | |
| Ashley | 1,847 | 0 | 0 | 0 | 1,847 | 0 | 1,847 | 0 | 0 |
| Dixie | 531 | 6,093 | 0 | 0 | 6,624 | 680 | 5,944 | 0 | 0 |
| Fishlake | 72 | 183 | 0 | 0 | 255 | 230 | 25 | 0 | 0 |
| Manti-LaSal | 0 | 0 | 1,331 | 200 | 1,531 | 0 | 1,531 | 0 | 0 |
| Uinta | 0 | 0 | 63 | 0 | 63 | 63 | 0 | 0 | 0 |
| Wasatch-Cache | 916 | 729 | 0 | 0 | 1,645 | 450 | 1,195 | 0 | 0 |
| Subtotal | 3,366 | 7,005 | 1,394 | 200 | 11,965 | 1,423 | 10,542 | 0 | 0 |
| Vermont | | | | | | | | | |
| Green Mountain (subtotal) | 928 | 1,668 | 238 | 3 | 2,837 | 1,540 | 1,297 | 0 | 0 |
| Virginia | | | | | | | | | |
| George Washington | 140 | 303 | 60 | 685 | 1,188 | 1,148 | 40 | 0 | 0 |
| Jefferson | 18 | 1,172 | 305 | 539 | 2,034 | 610 | 1,314 | 0 | 110 |
| Subtotal | 158 | 1,475 | 365 | 1,224 | 3,222 | 1,758 | 1,354 | 0 | 110 |

See footnotes at end of table.

**Table 24–Timber stand improvement needs as of October 1, 1991, by State, forest, and cubic foot productivity class--Continued**

| State, Commonwealth, or Territory 1/ National Forest | All timber stand improvement Cubic foot productivity classes 2/ 0-49 | 50-84 | 85-119 | 120+ | Total | Release subtotal | Thinning subtotal | Fertili-zation subtotal | Pruning subtotal |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Acres* | | | | | |
| Washington | | | | | | | | | |
| Colville | 845 | 3,271 | 3,535 | 0 | 7,651 | 1,679 | 5,972 | 0 | 0 |
| Gifford Pinchot | 0 | 13,892 | 5,566 | 4,925 | 24,383 | 497 | 19,968 | 2,432 | 1,486 |
| Idaho Panhandle | 175 | 0 | 701 | 340 | 1,216 | 236 | 980 | 0 | 0 |
| Mt. Baker-Snoqualmie | 0 | 120 | 4,607 | 2,836 | 7,563 | 236 | 5,101 | 2,026 | 200 |
| Okanogan | 2,307 | 3,832 | 769 | 0 | 6,908 | 3,058 | 3,750 | 0 | 100 |
| Olympic | 77 | 1,115 | 8,665 | 1,403 | 11,260 | 339 | 8,291 | 2,130 | 500 |
| Umatilla | 1,862 | 2,251 | 11 | 0 | 4,124 | 154 | 3,882 | 46 | 42 |
| Wenatchee | 0 | 19,838 | 5,427 | 0 | 25,265 | 4,682 | 13,181 | 4,601 | 2,801 |
| Subtotal | 5,266 | 44,319 | 29,281 | 9,504 | 88,370 | 10,881 | 61,125 | 11,235 | 5,129 |
| West Virginia | | | | | | | | | |
| George Washington | 0 | 0 | 0 | 399 | 399 | 399 | 0 | 0 | 0 |
| Monongahela | 14 | 216 | 801 | 466 | 1,497 | 910 | 587 | 0 | 0 |
| Subtotal | 14 | 216 | 801 | 865 | 1,896 | 1,309 | 587 | 0 | 0 |
| Wisconsin | | | | | | | | | |
| Chequamegon | 0 | 1,149 | 104 | 0 | 1,253 | 1,208 | 45 | 0 | 0 |
| Nicolet | 129 | 776 | 263 | 32 | 1,200 | 500 | 120 | 0 | 580 |
| Subtotal | 129 | 1,925 | 367 | 32 | 2,453 | 1,708 | 165 | 0 | 580 |
| Wyoming | | | | | | | | | |
| Bighorn | 12,116 | 314 | 0 | 0 | 12,430 | 1,526 | 10,904 | 0 | 0 |
| Black Hills | 850 | 224 | 0 | 0 | 1,074 | 0 | 1,074 | 0 | 0 |
| Bridger-Teton | 130 | 322 | 927 | 0 | 1,379 | 0 | 1,379 | 0 | 0 |
| Medicine Bow | 7,183 | 320 | 0 | 0 | 7,503 | 523 | 6,980 | 0 | 0 |
| Subtotal | 20,279 | 1,180 | 927 | 0 | 22,386 | 2,049 | 20,337 | 0 | 0 |
| Total | 172,452 | 345,526 | 400,107 | 388,618 | 1,306,703 | 492,436 | 712,224 | 80,451 | 21,592 |

1/ States not listed had no timber stand improvement needs as of October 1, 1991.
2/ Cubic foot productivity class refers to the cubic feet of wood produced per acre per year in a natural unmanaged stand.

**Table 25–Timber stand improvement program needs--fiscal years 1991-93**

| | Work needs | Annual program, appropriated funds 1/ | |
|---|---|---|---|
| | *1,000 acres* | *1,000 acres* | *Million dollars* |
| 10/1/90 balance | 1,214 | | |
| Fiscal year 1991: | | | |
| New needs | 489 | | |
| Accomplishments contributed 2/ | -396 | 226.4 | 32.0 |
| 10/1/91 balance | 1,307 | | |
| Fiscal year 1992: | | | |
| Projected new needs | 400 | | |
| Projected accomplishments | -329 | 134.0 | 32.3 |
| Projected 10/1/92 balance | 1,378 | | |
| Fiscal year 1993: | | | |
| Projected new needs | 350 | | |
| Projected accomplishments | -257 | | |
| Projected 10/1/93 balance | 1,471 | | |

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.
2/ This represents over 4 years of future accomplishments.

Photo by Roy Murphy

**Table 26–Timber offered, sold, unsold and harvested--fiscal years 1987-91**

| | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| Offered | | | | | |
| Volume (billion board feet) | 6.2 | 11.1 | 10.5 | 11.3 | 11.5 |
| Volume (billion cubic feet) 1/ | (1.2) | | | | |
| Sold | | | | | |
| Number of sales 2/ | 271,963 | 262,781 | 275,895 | 251,557 | 289,043 |
| Volume (billion board feet) | 6.4 | 9.3 | 8.4 | 11.0 | 11.3 |
| Volume (billion cubic feet) | (1.2) | | | | |
| Value (million dollars) 3/ | 801.2 | 1,609.9 | 1,077.5 | 1,254.4 | 1,003.4 |
| Difference 4/ | | | | | |
| Volume (billion board feet) | -0.2 | 1.8 | 2.1 | 0.3 | 0.2 |
| Volume (billion cubic feet) | -0.04 | | | | |
| Harvested | | | | | |
| Volume (billion board feet) | 8.5 | 10.5 | 12.0 | 12.6 | 12.7 |
| Volume (billion cubic feet) | 1.6 | | | | |
| Value (million dollars) 5/ | 1,008.6 | 1,187.6 | 1,309.7 | 1,235.7 | 1,016.0 |

1/ Conversion from the 1990 RPA Program.
2/ This is the number of sales that can be converted to board feet. Not included are 253,981 sales of nonconvertible product in FY 1991. (See table 29 for number of nonconvertible product sales per year.)
3/ This is the high bid value from all sales sold and includes stumpage, cost of reforestation, stand improvement costs, and timber salvage. Does not include value of roads or brush disposal.
4/ Difference between total volume offered and sold.
5/ This is the current stumpage rate for the actual volume harvested and includes the reforestation and stand improvement costs and timber salvage. Does not include value of roads or brush disposal.

Photo by Ken Hammond

**Table 27–Timber offered, sold, unsold, and harvested by Region--fiscal years 1990-91**

| | 1991 | | | | 1990 | | | |
|---|---|---|---|---|---|---|---|---|
| | Offered 1/ | Sold 2/ | Difference 3/ | Harvested 4/ | Offered 1/ | Sold 2/ | Difference | Harvested 4/ |
| | *Million board feet* | | | | | | | |
| Northern | 838.5 | 672.5 | 166.0 | 799.5 | 785.7 | 694.3 | 76.3 | 1,015.5 |
| Rocky Mountain | 329.6 | 291.0 | 38.6 | 400.6 | 369.7 | 367.9 | 68.6 | 380.9 |
| Southwestern | 279.5 | 282.2 | -2.7 | 344.1 | 328.8 | 305.0 | 23.8 | 433.3 |
| Intermountain | 338.8 | 282.7 | 56.1 | 360.0 | 406.0 | 415.0 | (9.0) | 415.8 |
| Pacific Southwest | 1,022.9 | 881.2 | 141.7 | 1,313.3 | 1,644.2 | 1,501.1 | 143.1 | 1,712.2 |
| Pacific Northwest | 1,093.9 | 2,105.8 | -1,011.9 | 3,166.5 | 5,047.9 | 3,997.1 | 1,050.8 | 3,878.4 |
| Southern | 1,129.4 | 1,045.1 | 84.3 | 1,029.9 | 1,363.0 | 1,207.8 | 155.2 | 1,422.2 |
| Eastern | 791.5 | 781.2 | 10.3 | 696.4 | 775.0 | 732.0 | 43.0 | 752.0 |
| Alaska | 356.0 | 52.9 | 303.1 5/ | 364.6 | 338.3 | 29.6 2/ | 308.7 5/ | 471.7 |
| Total 6/ | 6,180.1 | 6,394.6 | -214.5 | 8,474.9 | 11,058.6 | 9,249.8 | 1,860.5 | 10,482.0 |

1/ Sales offered for the fiscal year being displayed.
2/ Includes sales offered in prior fiscal years and sold in the fiscal year being displayed and miscellaneous small sales that were previously offered and/or sold and were reoffered and sold in the fiscal year being displayed. Does not include the volume of long-term sales released for harvesting.
3/ These were the timber sales that were offered but withdrawn (782.3 MMBF); offered but not opened until after 9/30/91 (415.6 MMBF); and no bid sales (171.9 MMBF). In addition, there were 1,584.4 MMBF of sale volume carried from FY 1990 that sold in FY 1991.
4/ Includes the volume harvested on long-term sales.
5/ Includes long-term sales volume prepared in the offered column.
6/ Columns may not add due to rounding.

**Table 28–Timber sold and harvested by State--fiscal year 1991 1/**

| State or Commonwealth 3/ | Timber sold | | | Timber harvested 2/ | |
|---|---|---|---|---|---|
| | Sales | Volume | Bid value 4/ | Volume | Receipts 4 |
| | | *MBF 5/* | *Actual dollars* | *MBF 5/* | *Actual dollars* |
| Alabama | 891 | 108,436 | 6,582,605 | 79,638 | 4,824,143 |
| Alaska | 103 | 52,891 | 2,336,728 | 364,649 | 13,756,272 |
| Arizona | 19,882 | 208,698 | 13,675,507 | 272,792 | 15,348,818 |
| Arkansas | 2,378 | 60,103 | 4,130,820 | 139,483 | 11,298,481 |
| California | 52,897 | 886,410 | 135,698,826 | 1,318,989 | 169,565,058 |
| Colorado | 27,174 | 140,727 | 5,115,152 | 200,682 | 3,486,781 |
| Florida | 119 | 89,614 | 5,262,520 | 58,014 | 4,179,998 |
| Georgia | 1,337 | 63,294 | 4,820,364 | 52,116 | 3,797,097 |
| Idaho | 29,540 | 601,758 | 54,452,331 | 705,945 | 48,148,331 |
| Illinois | 93 | 6,005 | 391,736 | 4,114 | 146,904 |
| Indiana | 16 | 27 | 347 | 42 | 1,015 |
| Kentucky | 1,186 | 31,759 | 1,456,608 | 39,632 | 1,634,000 |
| Louisiana | 1,174 | 112,737 | 10,653,241 | 122,035 | 9,993,670 |
| Maine | 29 | 926 | 63,547 | 265 | 2,695 |
| Michigan | 916 | 226,379 | 6,497,436 | 196,933 | 4,911,750 |
| Minnesota | 267 | 167,490 | 4,491,351 | 159,167 | 2,596,156 |
| Mississippi | 1,633 | 239,793 | 22,422,121 | 222,821 | 18,844,046 |
| Missouri | 1,593 | 58,155 | 3,223,101 | 50,432 | 2,875,210 |
| Montana | 14,474 | 277,512 | 25,109,956 | 350,801 | 28,278,715 |
| Nebraska | 11 | 36 | 225 | 499 | 9,970 |
| Nevada | 1,884 | 2,857 | 31,528 | 3,060 | 32,759 |
| New Hampshire | 248 | 23,121 | 891,002 | 30,737 | 1,018,064 |
| New Mexico | 14,597 | 73,473 | 2,859,842 | 71,289 | 1,654,576 |
| New York | 15 | 414 | 4,514 | 534 | 20,772 |
| North Carolina | 1,604 | 49,698 | 1,318,451 | 55,996 | 1,204,632 |
| North Dakota | 38 | 53 | 650 | 107 | 1,010 |
| Ohio | 107 | 3,588 | 294,920 | 6,307 | 444,805 |
| Oklahoma | 80 | 6,514 | 608,652 | 29,738 | 2,167,675 |
| Oregon | 47,453 | 1,604,227 | 351,764,094 | 2,348,920 | 479,491,831 |
| Pennsylvania | 158 | 80,540 | 15,854,884 | 68,231 | 15,022,214 |
| South Carolina | 284 | 88,640 | 5,607,087 | 74,418 | 4,112,392 |
| South Dakota | 2,657 | 104,984 | 6,821,597 | 113,220 | 7,266,483 |
| Tennessee | 701 | 26,047 | 1,269,451 | 25,073 | 966,659 |
| Texas | 901 | 109,105 | 13,680,794 | 61,536 | 7,103,757 |
| Utah | 13,223 | 53,198 | 2,007,338 | 65,775 | 2,076,491 |
| Vermont | 20 | 5,938 | 262,479 | 10,766 | 321,856 |
| Virginia | 3,626 | 52,587 | 1,471,897 | 64,736 | 1,359,641 |
| Washington | 14,268 | 502,436 | 81,357,332 | 827,927 | 131,661,983 |
| West Virginia | 630 | 44,849 | 2,618,555 | 40,872 | 2,539,787 |
| Wisconsin | 238 | 170,530 | 3,942,880 | 132,680 | 2,480,209 |
| Wyoming | 13,518 | 58,902 | 2,185,724 | 103,946 | 3,939,159 |
| Total 6/ | 271,963 | 6,394,452 | 801,238,190 | 8,474,919 | 1,008,585,867 |

1/ Excludes nonconvertible products such as Christmas trees, cones, burls, etc.
2/ Preliminary.
3/ States not listed had no timber sold or harvested in fiscal year 1991.
4/ Includes Knutson-Vandenberg and salvage sale receipts. Does not include brush disposal and road costs.
5/ MBF = thousand board feet.
6/ Columns may not add due to rounding.

**Table 29–Number of sales, volume, and value of timber sold on National Forest lands by size class--fiscal years 1987-91**

| | Sale size class | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | To 300 | 301-2,000 | $2,001-2,000 MBF1/ | 2,001-5,000 MBF | 5,001-15,000 MBF | 15,001 MBF and over | Nonconvertibles 2/ | Total less nonconvertibles 3/ |
| 1987 | | | | | | | | |
| Number of sales | 273,210 | 11,795 | 2,684 | 641 | 662 | 51 | 224,751 | 289,043 |
| Volume (MBF) | 672,064 | 245,148 | 1,533,199 | 2,087,251 | 5,833,972 | 947,353 | 0 | 11,318,987 |
| Value ($1,000) | 4,615.2 | 4,550.9 | 96,869.4 | 163,158.6 | 633,067.2 | 101,128.6 | 1,885.9 | 1,003,389.9 |
| 1988 | | | | | | | | |
| Number of sales | 233,567 | 13,791 | 2,806 | 701 | 652 | 40 | 249,784 | 251,557 |
| Volume (MBF) | 550,589 | 242,616 | 1,514,723 | 2,304,845 | 5,562,653 | 792,807 | 0 | 10,968,233 |
| Value ($1,000) | 3,944.0 | 4,691.7 | 114,447.7 | 252,343.8 | 791,130.5 | 87,829.9 | 2,401.5 | 1,254,387.6 |
| 1989 | | | | | | | | |
| Number of sales | 253,542 | 18,392 | 2,849 | 615 | 462 | 35 | 250,081 | 275,895 |
| Volume (MBF) | 555,149 | 276,650 | 1,612,985 | 1,947,180 | 3,510,835 | 511,786 | 0 | 8,414,585 |
| Value ($1,000) | 4,244 | 6,830 | 130,713 | 225,523 | 629,542 | 80,683 | 2,864 | 1,077,534 |
| 1990 | | | | | | | | |
| Number of sales | 247,078 | 11,258 | 3,274 | 645 | 503 | 23 | 253,981 | 262,781 |
| Volume (MBF) | 491,767 | 239,889 | 1,799,519 | 2,154,272 | 4,137,737 | 426,510 | 0 | 9,249,695 |
| Value ($1,000) | 4,190 | 6,841 | 179,729 | 361,163 | 980,264 | 77,737 | 2,882 | 1,609,925 |
| 1991 | | | | | | | | |
| Number of sales | 255,653 | 12,451 | 2,976 | 524 | 325 | 34 | 239,165 | 271,963 |
| Volume (MBF) | 461,276 | 237,284 | 1,473,391 | 1,599,520 | 2,319,924 | 303,057 | 0 | 6,394,452 |
| Value ($1,000) | 4,455 | 4,926 | 122,843 | 194,426 | 433,999 | 40,588 | 2,747 | 801,237 |

1/ MBF = thousand board feet.
2/ Nonconvertible products include Christmas trees, cones, burls, etc.
3/ May not add due to rounding.

**Table 30–Uncut timber volume under contract by Region--fiscal years 1987-91**

| Region | 1991 | | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|---|
| | MMBF 1/ | MMCF 2/ | Million board feet | | | |
| Northern | 1,599 | 391 | 1,839 | 2,210 | 2,382 | 2,618 |
| Rocky Mountain | 763 | 175 | 908 | 912 | 1,036 | 1,154 |
| Southwestern | 334 | 56 | 434 | 606 | 768 | 936 |
| Intermountain | 550 | 112 | 639 | 612 | 620 | 772 |
| Pacific Southwest | 1,411 | 219 | 2,240 | 2,650 | 3,275 | 3,943 |
| Pacific Northwest | 4,909 | 963 | 8,029 | 7,112 | 9,959 | 11,241 |
| Southern | 1,308 | 244 | 1,354 | 1,673 | 1,543 | 1,948 |
| Eastern | 1,746 | 283 | 1,712 | 1,732 | 1,778 | 1,820 |
| Alaska | 185 | 47 | 269 | 377 | 417 | 438 3/ |
| Total | 12,805 | 2,490 | 17,424 | 17,884 | 21,778 | 24,870 |

1/ Volume in local scale. Long-term sales not included. Long-term sales volume under contract at the end of fiscal year 1991 was 4,771 million board feet and 5,293 million board feet in 1990.
2/ Million cubic feet conversions based on 1990 RPA Program.
3/ Corrected figure; reported wrong in 1987 report.


F S Photo

**Table 31–Timber sale funding--fiscal years 1989-91 1/**

| | 1991 | 1990 | 1989 |
|---|---|---|---|
| | | *1,000 dollars* | |
| National Forest System | | | |
| Timber management | 197,403 | 185,561 | 149,782 |
| Harvest administration | 65,730 | 66,235 | 57,556 |
| Excess timber receipts | - | - | 29,252 |
| Subtotal | 263,133 | 251,796 | 236,590 |
| Support to timber sales program | | | |
| Minerals | 1,428 | 1,389 | 1,396 |
| Forest fire protection | 3,651 | 4,063 | 4,564 |
| Recreation | 12,102 | 12,406 | 10,358 |
| Wildlife and fish | 10,942 | 9,700 | 9,470 |
| Range | 1,151 | 989 | 881 |
| Soil and water | 7,538 | 9,057 | 8,619 |
| Landline location | 19,851 | 18,355 | 19,851 |
| Subtotal | 56,663 | 55,959 | 55,139 |
| Road construction | | | |
| Forest Service construction | 119,088 | 93,030 | 120,028 |
| Purchaser construction | (110,000) | (120,310) | (81,193) |
| Purchaser construction by the Forest Service | 4,859 | 2,946 | 2,762 |
| Subtotal | 123,947 | 95,976 | 122,790 |
| Total, appropriated accounts | 443,743 | 403,731 | 414,519 |
| Special accounts 2/ | | | |
| Timber salvage sales | 117,620 | 111,006 | 47,561 |
| Tongass timber supply fund 3/ | - | 36,955 | 35,034 |
| Subtotal | 117,620 | 147,961 | 82,595 |
| Total | 561,363 | 551,692 | 497,114 |

1/ Timber sale preparation and offer costs displayed are the actual appropriated funds for FY 1989-91. Costs displayed in TSPIRS tables 32-34 are the accrued costs for the FY 1991 timber program.
2/ Includes General Administration expenses.
3/ Included in appropriated accounts.

**Table 32—Statement of timber sale revenues and expenses--fiscal year 1991 1/**

| Account activity | Totals 2/ |
|---|---|
| | *1,000 dollars* |
| Revenues | |
| Timber sales | 1,006,562 |
| Purchaser road credits established | 83,735 |
| Associated charges | 65,865 |
| Interest and penalties | 1,570 |
| Total revenues | 1,157,732 |
| Direct expenses | |
| Timber sale expenses | 523,664 |
| Timber program expenses | 98,367 |
| Total direct expenses | 622,031 |
| Indirect expenses | |
| Timber sale expenses | 2,068 |
| Timber program expenses | 61,306 |
| Total indirect expenses | 63,374 |
| Total expenses | 685,405 |
| Gain/loss before payment to states | 472,328 |
| Payment to states | 301,394 |
| Volume harvested (BBF) | 8 |

1/ Source data from Statement of Revenues and Expenses of Timber Sale Program Information Reporting System (TSPIRS). TSPIRS is an accounting report which allocates capital expenditures, such as costs for roads, facilities, and investments in roads, differently from that in the funding report, as represented in table 31. For this reason, the various cost and expenditure data in the two tables are not directly comparable.

2/ These are national totals for 1991. The Timber Sale Program Annual Report, with Forest and State level information, will be available in the spring of 1992.

**Table 33—Timber sale program—employment, income, and program level account--fiscal year 1991 1/**

| | Units | Totals |
|---|---|---|
| Employment and income | | |
| Total employment (jobs) | Jobs | 103,158 |
| Total income (M$) | 1,000 dollars | 4,742,919 |
| Federal income taxes generated (M$) | 1,000 dollars | 713,093 |
| Related timber information | | |
| Timber | | |
| Offered | MMBF 2/ | 6,180.1 |
| Sold and awarded | MMBF | 6,394.6 3/ |
| Harvested | | |
| Sawtimber | MMBF | 6,398.1 |
| Roundwood | MMBF | 1,594.9 |
| Other | MMBF | 481.9 4/ |
| Total harvested | | 8,474.9 |
| Total acres harvested | Acres | 846,000 |
| Fuelwood | | |
| Free use | MMBF | 125.6 |
| Nonconvertible products | | |
| Christmas trees sold | Trees | 393,568 |
| Other (M$) | 1,000 dollars | 7,031 |
| Regeneration acres treated | Acres | 477,064 |
| Timber stand improvement treatments | Acres | 399,000 |
| Forest road program (in support of the timber program) | | |
| Construction | | |
| Appropriated | Miles | 85 |
| Purchaser credit | Miles | 1,113 |
| Total construction | Miles | 1,198 |
| Reconstruction | | |
| Appropriated | Miles | 470 |
| Purchaser credit | Miles | 2,834 |
| Total reconstruction | Miles | 3,304 |

1/ These are national totals for 1991. The Timber Sale Program Annual Report, with Forest and State level information, will be available in the spring of 1992.
2/ MMBF = million board feet.
3/ Does not include volume released from long-term timber sales; TSPIRS reports do include this volume.
4/ Does not agree with FY 1992 Explanatory Notes due to more current information being available.

**Table 34—Timber sale program—the economic account--fiscal year 1991 1/**

| | Totals |
|---|---|
| | *1,000 dollars* |
| Present value of benefits | |
| Positive effects | |
| Timber | 1,512,669 |
| Recreation | 26,429 |
| Wildlife | 29,902 |
| Fisheries | 2,502 |
| Grazing | 2,903 |
| Soils | 212 |
| Water | 62,925 |
| Total | 1,637,542 |
| Negative effects | |
| Timber | 0 |
| Recreation | 1,068 |
| Wildlife | 6,156 |
| Fisheries | 1,929 |
| Grazing | 40 |
| Soils | 547 |
| Water | 13 |
| Total | 9,753 |
| Total present benefits (positive less negative) | 1,627,789 |
| Present value of costs | |
| Timber | 507,936 |
| Recreation | 4,860 |
| Wildlife | 8,761 |
| Fisheries | 2,296 |
| Grazing | 991 |
| Soils | 686 |
| Water | 447 |
| Roads | 209,502 |
| Total | 735,479 |
| Present net value for timber only | 795,231 |
| Present net value | 892,310 |

1/ These are national totals for 1991. The Timber Sale Program Annual Report, with Forest and State level information, will be available in the spring of 1992.

**Table 35–Range allotment management status by Region--fiscal year 1991**

| Region | Number of allotments | | | Acres | |
|---|---|---|---|---|---|
| | Total | With approved plans | With plans implemented | Total | Suitable 1/ |
| Northern | 1,681 | 1,480 | 1,376 | 11,160,098 | 4,139,706 |
| Rocky Mountain | 2,477 | 1,954 | 1,816 | 18,066,539 | 8,347,197 |
| Southwestern | 1,425 | 1,309 | 1,262 | 19,334,755 | 13,021,315 |
| Intermountain | 1,895 | 1,602 | 1,588 | 26,283,174 | 11,529,972 |
| Pacific Southwest | 817 | 642 | 622 | 11,454,659 | 4,456,783 |
| Pacific Northwest | 727 | 516 | 467 | 11,402,001 | 6,752,651 |
| Southern | 576 | 346 | 323 | 1,860,437 | 1,350,593 |
| Eastern | 200 | 146 | 143 | 93,651 | 41,542 |
| Total | 9,798 | 7,995 | 7,597 | 99,655,314 | 49,639,759 |

1/ Suitable acres are acres accessible to livestock and which can be grazed on a sustained yield basis without damage to the resource.

**Table 36–Range allotment management status--fiscal years 1987-91**

| | Unit of measure | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|---|
| Total allotments | Allotments | 9,798 | 9,834 | 9,752 | 9,868 | 9,610 1/ |
| With approved plans | Allotments | 7,995 | 8,000 | 8,050 | 8,077 | 8,090 |
| With plans implemented | Allotments | 7,597 | 7,467 | 7,050 | 7,473 | 7,335 |
| Total acres | MM acres | 100 | 104 | 104 | 104 | 100 |
| Suitable acres | MM acres | 50 | 50 | 50 | 50 | 50 |
| Permitted use 2/ | MM AUM's | 9.6 | 9.6 | 9.6 | 9.9 | 9.9 |
| Actual use | MM AUM's | 7.3 | 8.1 | 7.8 | 8.4 | 8.4 |

1/ Does not include vacant allotments.
2/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow or the equivalent for 1 month.

**Table 37–Actual grazing use in AUM's by State--fiscal year 1991 1/**

| State, Commonwealth, or Territory 2/ | Cattle | Sheep | Domestic horses | Wild horses | Wild burros | Total |
|---|---|---|---|---|---|---|
| Alabama | 2,333 | 0 | 97 | 0 | 0 | 2,430 |
| Arizona | 803,350 | 18,502 | 5,730 | 60 | 528 | 828,170 |
| Arkansas | 9,799 | 0 | 7 | 0 | 0 | 9,806 |
| California | 388,805 | 31,768 | 20,428 | 7,500 | 1,800 | 450,301 |
| Colorado | 749,536 | 152,012 | 20,931 | 0 | 0 | 922,479 |
| Florida | 32,018 | 0 | 0 | 0 | 0 | 32,018 |
| Georgia | 5,203 | 0 | 0 | 0 | 0 | 5,203 |
| Idaho | 489,631 | 124,761 | 18,812 | 0 | 0 | 633,204 |
| Illinois | 16,400 | 11,254 | 58 | 0 | 0 | 27,712 |
| Kansas | 40,724 | 0 | 0 | 0 | 0 | 40,724 |
| Kentucky | 180 | 0 | 0 | 0 | 0 | 180 |
| Louisiana | 20,220 | 0 | 0 | 0 | 0 | 20,220 |
| Michigan | 1,304 | 0 | 0 | 0 | 0 | 1,304 |
| Minnesota | 116 | 0 | 0 | 0 | 0 | 116 |
| Mississippi | 7,632 | 0 | 0 | 0 | 0 | 7,632 |
| Missouri | 25,424 | 0 | 0 | 0 | 0 | 25,424 |
| Montana | 516,760 | 16,486 | 23,543 | 350 | 0 | 557,139 |
| Nebraska | 114,982 | 0 | 8 | 0 | 0 | 114,990 |
| Nevada | 214,516 | 43,464 | 3,184 | 13,782 | 840 | 275,786 |
| New Mexico | 739,687 | 22,227 | 10,334 | 1,836 | 0 | 774,084 |
| New York | 8,971 | 0 | 208 | 0 | 0 | 9,179 |
| North Dakota | 430,989 | 90 | 2,831 | 0 | 0 | 433,910 |
| Ohio | 2,286 | 0 | 7 | 0 | 0 | 2,293 |
| Oklahoma | 22,977 | 0 | 11 | 0 | 0 | 22,988 |
| Oregon | 440,954 | 35,810 | 6,030 | 2,580 | 0 | 485,374 |
| South Dakota | 406,996 | 4,426 | 247 | 0 | 0 | 411,669 |
| Texas | 62,656 | 0 | 47 | 0 | 0 | 62,703 |
| Utah | 374,741 | 179,842 | 1,609 | 700 | 0 | 556,892 |
| Vermont | 232 | 0 | 0 | 0 | 0 | 232 |
| Virginia | 7,212 | 0 | 907 | 0 | 0 | 8,119 |
| Washington | 98,329 | 11,783 | 4,224 | 0 | 0 | 114,336 |
| West Virginia | 9,299 | 141 | 28 | 0 | 0 | 9,468 |
| Wyoming | 475,993 | 125,745 | 11,404 | 0 | 0 | 613,142 |
| Total | 6,520,255 | 778,311 | 130,685 | 26,808 | 3,168 | 7,459,227 |

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.
2/ States not listed had no Forest Service grazing program in 1990.

**Table 38–Annual grazing statistics--fiscal year 1991**

| | Permittees | Cattle | | Horses and burros | | Sheep and goats | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Number* | *AUM's 1/* | *Number* | *AUM's* | *Number* | *AUM's* | *Number* | *AUM's* |
| Permitted to graze | | 1,388,671 | 8,461,888 | 83,481 | 107,581 | 1,180,452 | 984,442 | 2,652,604 | 9,553,911 |
| Actually grazed: | | | | | | | | | |
| Paid permits | 10,491 | 1,133,702 | 6,492,239 | 14,214 | 46,768 | 944,843 | 765,210 | 2,092,759 | 7,304,217 |
| Free use: | | | | | | | | | |
| Recreation stock | 21,155 2/ | | | 70,799 | 57,126 | | | 70,799 | 57,126 |
| Other free use | 137 | 2,055 | 17,202 | 1,193 | 12,745 | 1,484 | 11,378 | 4,732 | 41,325 |
| Private land permits 3/ | (413) | (44,525) | (380,150) | (372) | (4,904) | (12,302) | (12,449) | (57,199) | (397,503) |
| Crossing | 25 | 10,703 | 5,359 | 204 | 13 | 9,937 | 1,295 | 20,844 | 6,667 |
| Unauthorized use | 32 | 1,927 | 5,430 | 85 | 573 | 1,516 | 428 | 3,528 | 6,431 |
| Subtotal 3/ | 31,840 | 1,148,387 | 6,520,230 | 86,495 | 117,225 | 957,780 | 778,311 | 2,192,662 | 7,415,766 |
| Wild horses | | | | 835 | 12,504 | | | 835 | 12,504 |
| Wild burros | | | | 178 | 956 | | | 178 | 956 |
| Total actually grazed 3/ | 31,840 | 1,148,387 | 6,520,230 | 87,508 | 130,685 | 957,780 | 778,311 | 2,193,675 | 7,429,226 |

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.
2/ Includes term and temporary grazing permits and all other paid permits (e.g., transportation, research, working animals, special uses, etc.).
3/ Private land permit data not included in totals.

**Table 39–Planned and accomplished minerals cases by Region--fiscal year 1991**

| Region | Cases | |
|---|---|---|
| | Planned | Accomplished |
| Northern | 3,904 | 3,790 |
| Rocky Mountain | 2,359 | 2,280 |
| Southwestern | 2,121 | 1,998 |
| Intermountain | 3,720 | 3,494 |
| Pacific Southwest | 2,786 | 2,768 |
| Pacific Northwest | 3,050 | 3,284 |
| Southern | 3,695 | 4,137 |
| Eastern | 2,719 | 2,657 |
| Alaska | 924 | 940 |
| Total | 25,278 | 25,348 |

**Table 40–Energy mineral workload and production--fiscal years 1987-91**

| Fiscal year | Acres under lease | Oil production 1/ | Gas production | Coal production |
|---|---|---|---|---|
| | *Millions* | *Barrels* | *1,000 cu.ft.* | *Short tons* |
| 1987 | 23.2 | 14,900,000 | 190,000,000 | 41,200,000 |
| 1988 | 17.8 | 13,300,000 | 191,000,000 | 41,200,000 |
| 1989 | 14.2 | 12,100,000 | 204,000,000 | 65,500,000 |
| 1990 | 12.0 | 11,800,000 | 210,000,000 | 75,000,000 |
| 1991 | 12.0 | 11,550,000 | 201,000,000 | 85,600,000 |

1/ Estimates for years prior to 1991 are updated.

**Table 41–Road and bridge construction and reconstruction by State--fiscal year 1991**

| State or Commonwealth 2/ | From Appropriated Funds 1/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Construction | | | | Reconstruction | | | |
| | Roads | | Bridges | | Roads | | Bridges | |
| | Miles | Cost | No. | Cost | Miles | Cost | No. | Cost |
| | | *1000 dollars* | | *1000 dollars* | | *1000 dollars* | | *1000 dollars* |
| Alabama | 0.0 | 96.5 | 0 | 0.0 | 2.4 | 635.3 | 0 | 0.3 |
| Alaska 4/ | 7.9 | 11,486.3 | 0 | 187.6 | 1.3 | 1,653.3 | 40 | 2,784.7 |
| Arizona | 8.8 | 2,001.0 | 0 | 0.0 | 19.8 | 4,499.7 | 5 | 198.9 |
| Arkansas | 0.0 | 563.8 | 0 | 0.0 | 13.7 | 1,916.7 | 0 | 0.0 |
| California | 1.0 | 3,006.5 | 5 | 372.2 | 45.8 | 13,168.1 | 2 | 280.1 |
| Colorado | 4.8 | 1,739.3 | 4 | 923.7 | 75.2 | 5,911.5 | 0 | 0.0 |
| Florida | 0.0 | 4.9 | 0 | 0.0 | 2.5 | 865.5 | 1 | 138.8 |
| Georgia | 0.2 | 760.7 | 0 | 0.0 | 24.0 | 1,990.3 | 2 | 21.7 |
| Idaho | 13.2 | 6,830.5 | 0 | 0.0 | 70.6 | 8,391.0 | 13 | 1,269.8 |
| Illinois | 0.0 | 0.0 | 0 | 0.0 | 1.3 | 523.5 | 2 | 191.4 |
| Indiana | 0.0 | 0.0 | 0 | 0.0 | 0.0 | 295.5 | 0 | 0.0 |
| Kansas | 0.7 | 79.1 | 0 | 0.0 | 7.4 | 20.4 | 0 | 0.0 |
| Kentucky | 4.6 | 638.0 | 0 | 0.0 | 3.4 | 585.3 | 0 | 0.0 |
| Louisiana | 0.2 | 75.4 | 0 | 0.0 | 4.8 | 968.8 | 2 | 79.4 |
| Maine | 0.2 | 60.5 | 0 | 0.0 | 0.0 | 36.8 | 0 | 0.0 |
| Michigan | 0.0 | 981.2 | 0 | 0.0 | 36.0 | 1,983.0 | 1 | 25.5 |
| Minnesota | 3.5 | 881.5 | 0 | 0.0 | 16.0 | 1,292.9 | 0 | 1.5 |
| Mississippi | 0.7 | 111.3 | 0 | 0.0 | 9.4 | 1,348.2 | 0 | 0.0 |
| Missouri | 0.0 | 0.0 | 0 | 0.0 | 30.4 | 921.8 | 0 | 0.0 |
| Montana | 6.7 | 5,772.6 | 0 | 0.0 | 94.9 | 8,733.3 | 7 | 428.7 |
| Nebraska | 0.0 | 0.0 | 0 | 0.0 | 0.0 | 26.3 | 0 | 0.0 |
| Nevada | 0.0 | 10.2 | 0 | 0.0 | 0.0 | 198.2 | 0 | 0.0 |
| New Hampshire | 0.3 | 219.7 | 0 | 0.0 | 0.0 | 147.0 | 0 | 0.0 |
| New Mexico | 7.7 | 1,400.2 | 0 | 0.0 | 71.7 | 6,112.8 | 0 | 20.0 |
| New York | 0.0 | 0.0 | 0 | 0.0 | 1.5 | 25.8 | 0 | 0.0 |
| North Carolina | 9.9 | 693.5 | 1 | 140.7 | 3.0 | 849.1 | 0 | 0.0 |
| Ohio | 0.0 | 98.3 | 0 | 0.0 | 0.0 | 295.5 | 2 | 12.5 |
| Oklahoma | 0.0 | 0.0 | 0 | 0.0 | 0.1 | 71.0 | 0 | 0.0 |
| Oregon | 2.7 | 14,971.7 | 0 | 0.0 | 94.9 | 17,023.8 | 3 | 474.6 |
| Pennsylvania | 5.0 | 460.9 | 0 | 0.0 | 3.3 | 654.5 | 2 | 151.6 |
| Puerto Rico | 0.0 | 26.1 | 0 | 0.0 | 0.0 | 26.1 | 0 | 0.0 |
| South Carolina | 1.5 | 298.4 | 0 | 0.0 | 7.3 | 507.0 | 0 | 0.0 |
| South Dakota | 0.0 | 214.6 | 0 | 0.0 | 22.7 | 1,521.0 | 2 | 69.1 |
| Tennessee | 2.5 | 296.4 | 0 | 0.0 | 9.9 | 969.6 | 6 | 181.2 |
| Texas | 0.2 | 123.7 | 0 | 0.0 | 0.1 | 679.2 | 0 | 0.0 |
| Utah | 0.4 | 1,029.6 | 0 | 0.0 | 10.5 | 2,747.3 | 0 | 0.9 |
| Vermont | 0.4 | 107.7 | 0 | 0.0 | 0.2 | 142.0 | 0 | 0.0 |
| Virginia | 4.8 | 825.9 | 0 | 0.0 | 28.7 | 1,895.4 | 2 | 28.9 |
| Washington | 1.6 | 6,390.2 | 2 | 61.2 | 23.3 | 6,900.7 | 3 | 421.0 |
| West Virginia | 4.0 | 704.7 | 0 | 0.0 | 7.8 | 1,037.8 | 0 | 0.0 |
| Wisconsin | 2.5 | 702.9 | 0 | 0.0 | 43.1 | 2,849.4 | 1 | 122.9 |
| Wyoming | 0.2 | 584.3 | 0 | 0.0 | 26.7 | 2,142.0 | 3 | 201.7 |
| Total | 96.2 | 64,248.1 | 12 | 1,685.4 | 813.7 | 102,562.4 | 99 | 7,105.2 |

See footnotes at end of table.

**Table 41–Road and bridge construction and reconstruction by State--fiscal year 1991--Continued**

| By Timber Purchasers | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Construction | | | | Reconstruction | | | | |
| Roads | | Bridges | | Roads | | Bridges | | State or |
| Miles 3/ | Cost | No. | Cost | Miles 3/ | Cost | No. | Cost | Commonwealth 2/ |
| | *1000 dollars* | | *1000 dollars* | | *1000 dollars* | | *1000 dollars* | |
| 6.0 | 100.6 | 0 | 0.0 | 15.3 | 256.4 | 0 | 0.0 | Alabama |
| 95.9 | 14,201.7 | 11 | 310.1 | 91.2 | 1,445.2 | 25 | 370.3 | Alaska 4/ |
| 8.3 | 83.0 | 0 | 0.0 | 184.9 | 1,229.3 | 0 | 0.0 | Arizona |
| 3.4 | 27.4 | 0 | 0.0 | 37.7 | 430.1 | 0 | 0.0 | Arkansas |
| 85.6 | 3,102.6 | 0 | 0.0 | 201.6 | 4,092.2 | 2 | 46.8 | California |
| 52.1 | 831.0 | 0 | 0.0 | 35.2 | 292.5 | 0 | 0.0 | Colorado |
| 1.3 | 20.5 | 0 | 0.0 | 28.0 | 517.3 | 0 | 0.0 | Florida |
| 5.0 | 139.9 | 0 | 0.0 | 28.2 | 237.7 | 0 | 0.0 | Georgia |
| 233.7 | 9,556.7 | 0 | 0.0 | 372.6 | 4,965.4 | 0 | 0.0 | Idaho |
| 0.1 | 1.7 | 0 | 0.0 | 2.7 | 24.9 | 0 | 0.0 | Illinois |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Indiana |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Kansas |
| 13.5 | 191.7 | 0 | 0.0 | 27.2 | 209.2 | 0 | 0.0 | Kentucky |
| 3.3 | 48.9 | 0 | 0.0 | 65.6 | 974.3 | 0 | 0.0 | Louisiana |
| 0.1 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Maine |
| 22.1 | 160.5 | 0 | 0.0 | 71.6 | 417.6 | 0 | 0.0 | Michigan |
| 6.6 | 97.2 | 0 | 0.0 | 7.0 | 74.4 | 0 | 0.0 | Minnesota |
| 6.2 | 263.0 | 0 | 0.0 | 125.5 | 1,716.2 | 0 | 0.0 | Mississippi |
| 0.0 | 0.0 | 0 | 0.0 | 27.4 | 120.7 | 0 | 0.0 | Missouri |
| 106.3 | 2,431.2 | 0 | 0.0 | 171.5 | 1,092.7 | 0 | 0.0 | Montana |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Nebraska |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Nevada |
| 2.6 | 100.7 | 0 | 0.0 | 1.7 | 34.5 | 0 | 0.0 | New Hampshire |
| 36.5 | 868.1 | 0 | 0.0 | 93.0 | 817.9 | 0 | 0.0 | New Mexico |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | New York |
| 11.3 | 335.4 | 0 | 0.0 | 36.4 | 293.3 | 0 | 0.0 | North Carolina |
| 2.0 | 17.2 | 0 | 0.0 | 0.2 | 2.0 | 0 | 0.0 | Ohio |
| 0.6 | 6.5 | 0 | 0.0 | 1.7 | 14.0 | 0 | 0.0 | Oklahoma |
| 200.0 | 7,575.9 | 0 | 0.0 | 539.6 | 9,182.8 | 0 | 0.0 | Oregon |
| 20.3 | 446.3 | 0 | 0.0 | 53.1 | 757.8 | 0 | 0.0 | Pennsylvania |
| 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | Puerto Rico |
| 1.7 | 42.2 | 0 | 0.0 | 32.8 | 359.7 | 0 | 0.0 | South Carolina |
| 10.6 | 325.3 | 0 | 0.0 | 80.3 | 779.2 | 0 | 0.0 | South Dakota |
| 14.9 | 234.2 | 0 | 0.0 | 19.6 | 77.6 | 0 | 0.0 | Tennessee |
| 1.2 | 46.8 | 0 | 0.0 | 75.8 | 1,213.0 | 0 | 0.0 | Texas |
| 7.6 | 78.3 | 0 | 0.0 | 68.9 | 154.3 | 0 | 0.0 | Utah |
| 0.8 | 13.4 | 0 | 0.0 | 0.4 | 12.7 | 0 | 0.0 | Vermont |
| 11.0 | 160.2 | 0 | 0.0 | 11.8 | 98.6 | 0 | 0.0 | Virginia |
| 124.2 | 4,406.1 | 0 | 0.0 | 119.1 | 1,314.3 | 0 | 0.0 | Washington |
| 20.5 | 739.8 | 0 | 0.0 | 17.7 | 555.1 | 0 | 0.0 | West Virginia |
| 18.8 | 111.5 | 0 | 0.0 | 52.5 | 261.0 | 0 | 0.0 | Wisconsin |
| 15.7 | 201.8 | 0 | 0.0 | 38.2 | 172.0 | 0 | 0.0 | Wyoming |
| 1,149.8 | 46,967.3 | 11 | 310.1 | 2,736.0 | 34,195.9 | 27 | 417.1 | Total |

1/ Includes funds for engineering and program support for appropriated roads and timber purchaser roads. Does not include $5,997,500 of Washington Office funds and $1,573,200 transferred to the Federal Highway Administration (FHWA). The FHWA funds provided for A&E planning and design for future year projects.

2/ States not listed had no Forest Service road programs in 1991.

3/ Does not include 69.2 miles of construction and 159.4 miles of reconstruction turned back to the Forest Service (Purchaser Election Program).

4/ Includes Tongass Timber Supply Fund, $14,758,000; 4.2 miles construction, 0.6 miles reconstruction, and 40 bridges.


Photo by Paul Keller

**Table 42–Purchaser election roads constructed by the Forest Service by State--fiscal year 1991**

| State or Commonwealth 1/ | Construction Roads | | Reconstruction Roads | |
|---|---|---|---|---|
| | Miles | Cost | Miles | Cost |
| | | *1000 dollars* | | *1000 dollars* |
| Alabama | 0.0 | 0.0 | 9.7 | 140.9 |
| California | 0.0 | 0.0 | 12.6 | 227.2 |
| Colorado | 0.0 | 34.9 | 0.0 | 0.0 |
| Florida | 0.0 | 0.0 | 14.1 | 108.9 |
| Georgia | 1.1 | 25.1 | 5.6 | 64.6 |
| Idaho | 5.4 | 183.7 | 13.5 | 103.0 |
| Louisiana | 0.5 | 17.9 | 3.4 | 54.2 |
| Michigan | 0.4 | 47.7 | 0 | 0 |
| Mississippi | 1.0 | 33.9 | 6.3 | 157.9 |
| Montana | 10.6 | 183.3 | 19.0 | 197.1 |
| New Hampshire | 0.7 | 34.5 | 1.3 | 27.4 |
| Oregon | 16.7 | 994.1 | 33.4 | 657.3 |
| Pennsylvania | 3.6 | 111.3 | 8.8 | 112.0 |
| South Dakota | 13.4 | 239.9 | 21.9 | 118.2 |
| Utah | 0.0 | 22.0 | 0.0 | 22.0 |
| Washington | 15.8 | 982.1 | 7.2 | 903.6 |
| West Virginia | 0.0 | 0.6 | 0.0 | 0.0 |
| Wyoming | 0.0 | 0.0 | 2.6 | 14.0 |
| Total | 69.2 | 2,911.0 | 159.4 | 2,908.3 |

1/ States not listed had no timber purchaser roads constructed by the Forest Service in 1991.

Photo by W Hutchinson

**Table 43—Road maintenance by State--fiscal year 1991**

| State or Commonwealth | Cost | | | Miles fully maintained 1/ | | | Miles lacking full maintenance 2/ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Level 1 Closed 3/ | Level 2 High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Level 1 Closed 3/ | Level 2 High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Level 1 Closed 3/ | Level 2 High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Total Miles 6/ |
| | *1000 dollars* | | | | | | | | | |
| Alabama | 42.0 | 44.2 | 632.4 | 236.0 | 535.0 | 563.0 | 30.0 | 150.0 | 120.0 | 1,634.0 |
| Alaska 7/ | 90.1 | 255.2 | 1,356.4 | 569.3 | 444.7 | 444.9 | 575.8 | 705.3 | 295.2 | 3,035.2 |
| Arizona | 308.6 | 941.0 | 3,267.7 | 601.3 | 2,038.7 | 3,307.5 | 2,002.9 | 21,970.5 | 1,372.6 | 31,293.5 |
| Arkansas | 62.5 | 221.3 | 1,160.6 | 520.0 | 3,206.0 | 707.0 | 1,750.0 | 2,506.0 | 889.0 | 9,578.0 |
| California | 1,947.0 | 4,792.4 | 11,579.2 | 3,217.2 | 11,578.8 | 7,495.4 | 3,145.9 | 14,877.7 | 4,179.1 | 44,494.1 |
| Colorado | 549.1 | 1,249.4 | 1,875.7 | 1,373.8 | 2,914.3 | 2,505.1 | 1,685.6 | 6,120.6 | 2,660.5 | 17,259.9 |
| Florida | 38.1 | 9.0 | 890.6 | 10.0 | 100.0 | 645.0 | 0.0 | 3,070.0 | 600.0 | 4,425.0 |
| Georgia | 252.1 | 179.3 | 550.2 | 33.0 | 181.0 | 114.0 | 75.0 | 484.0 | 571.0 | 1,458.0 |
| Idaho | 486.9 | 1,257.0 | 3,917.2 | 4,137.5 | 6,005.0 | 6,338.6 | 2,993.0 | 8,724.4 | 4,598.1 | 32,796.6 |
| Illinois | 49.6 | 217.4 | 362.6 | 233.0 | 273.0 | 99.0 | 201.0 | 265.0 | 84.0 | 1,155.0 |
| Indiana | 0.0 | 0.0 | 26.7 | 35.0 | 0.0 | 30.0 | 0.0 | 0.0 | 10.0 | 75.0 |
| Kansas | 0.0 | 10.1 | 0.0 | 0.0 | 15.0 | 9.0 | 0.0 | 185.0 | 40.0 | 249.0 |
| Kentucky | 3.0 | 35.4 | 694.7 | 270.0 | 303.0 | 382.0 | 29.0 | 91.0 | 100.0 | 1,175.0 |
| Louisiana | 39.4 | 26.7 | 612.7 | 200.0 | 1,345.0 | 568.0 | 10.0 | 448.0 | 190.0 | 2,761.0 |
| Maine | 4.0 | 5.5 | 59.2 | 29.0 | 5.0 | 24.0 | 0.0 | 3.0 | 9.0 | 70.0 |
| Michigan | 77.4 | 134.4 | 1,052.5 | 1,240.0 | 899.0 | 743.0 | 2,664.0 | 4,128.0 | 650.0 | 10,324.0 |
| Minnesota | 110.5 | 136.2 | 1,228.2 | 102.0 | 237.0 | 721.0 | 1,326.0 | 1,686.0 | 413.0 | 4,485.0 |
| Mississippi | 47.9 | 90.9 | 399.8 | 93.0 | 487.0 | 485.0 | 482.0 | 596.0 | 356.0 | 2,499.0 |
| Missouri | 25.2 | 141.4 | 275.7 | 0.0 | 640.0 | 526.0 | 112.0 | 1,216.0 | 194.0 | 2,688.0 |
| Montana | 391.7 | 1,421.6 | 3,959.0 | 3,320.0 | 5,518.0 | 6,333.0 | 3,169.0 | 7,428.0 | 4,300.0 | 30,068.0 |
| Nebraska | 102.1 | 59.9 | 120.4 | 11.2 | 105.0 | 85.0 | 0.0 | 147.9 | 29.5 | 378.6 |
| Nevada | 39.7 | 136.5 | 285.1 | 178.2 | 694.5 | 485.3 | 119.0 | 2,436.3 | 806.7 | 4,720.0 |
| New Hampshire | 12.3 | 32.1 | 236.7 | 130.0 | 71.0 | 98.0 | 30.0 | 10.0 | 40.0 | 379.0 |
| New Mexico | 394.7 | 1,408.0 | 1,931.0 | 1,472.8 | 2,079.4 | 1,411.5 | 2,762.8 | 12,573.9 | 1,517.9 | 21,818.3 |
| New York | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 3.0 |
| North Carolina | 111.9 | 60.9 | 929.9 | 103.0 | 669.0 | 495.0 | 0.0 | 350.0 | 350.0 | 1,967.0 |
| North Dakota | 0.0 | 27.7 | 36.2 | 0.0 | 340.0 | 227.0 | 0.0 | 113.0 | 52.0 | 732.0 |
| Ohio | 0.0 | 0.0 | 30.0 | 43.0 | 0.0 | 22.0 | 0.0 | 2.0 | 3.0 | 70.0 |
| Oklahoma | 1.4 | 12.4 | 80.2 | 45.0 | 298.0 | 94.0 | 3.0 | 167.0 | 97.0 | 704.0 |
| Oregon | 1,430.0 | 3,635.0 | 8,946.0 | 9,288.0 | 20,138.0 | 8,804.0 | 5,947.0 | 19,900.0 | 3,423.0 | 67,500.0 |
| Pennsylvania | 17.1 | 51.3 | 410.9 | 97.0 | 260.0 | 394.0 | 83.0 | 61.0 | 105.0 | 1,000.0 |
| Puerto Rico | 1.0 | 1.0 | 27.0 | 0.0 | 0.0 | 0.0 | 1.0 | 4.0 | 16.0 | 21.0 |

See footnotes at end of table.

**Table 43—Road maintenance by State--fiscal year 1991--Continued**

| State or Commonwealth | Cost | | | Miles fully maintained 1/ | | | Miles lacking full maintenance 2/ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Level 1 Closed 3/ | Level 2 High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Level 1 Closed 3/ | Level 2 High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Level 1 Closed 3/ | High Clearance 4/ | Levels 3,4,5 Passenger Car 5/ | Total Miles 6/ |
| | | *1000 dollars* | | | | | | | | |
| South Carolina | 22.8 | 47.9 | 1,409.6 | 0.0 | 0.0 | 0.0 | 536.0 | 138.0 | 992.0 | 1,666.0 |
| South Dakota | 132.0 | 271.2 | 615.3 | 197.4 | 763.9 | 852.5 | 789.5 | 2,258.0 | 13.0 | 4,874.3 |
| Tennessee | 22.7 | 46.0 | 491.4 | 49.0 | 391.0 | 320.0 | 10.0 | 501.0 | 183.0 | 1,454.0 |
| Texas | 91.6 | 219.7 | 753.6 | 195.0 | 673.0 | 30.0 | 0.0 | 1,187.0 | 430.0 | 2,515.0 |
| Utah | 75.9 | 762.7 | 1,946.7 | 116.4 | 2,771.4 | 1,889.4 | 411.9 | 5,782.5 | 944.0 | 11,915.6 |
| Vermont | 28.1 | 43.4 | 101.2 | 0.0 | 0.0 | 0.0 | 50.0 | 97.0 | 84.0 | 231.0 |
| Virginia | 100.6 | 226.0 | 954.8 | 115.0 | 460.0 | 242.0 | 245.0 | 991.0 | 740.0 | 2,793.0 |
| Washington | 439.0 | 2,319.1 | 5,956.5 | 2,383.0 | 5,015.0 | 4,269.0 | 1,845.0 | 6,712.0 | 2,079.0 | 22,303.0 |
| West Virginia | 12.7 | 20.7 | 797.2 | 211.0 | 586.0 | 609.0 | 34.0 | 161.0 | 88.0 | 1,689.0 |
| Wisconsin | 31.9 | 191.1 | 1,268.3 | 415.0 | 1,993.0 | 1,399.0 | 139.0 | 1,583.0 | 1,353.0 | 6,882.0 |
| Wyoming | 176.8 | 318.8 | 1,495.9 | 1,072.0 | 4,461.9 | 1,310.0 | 705.0 | 2,022.6 | 1,452.2 | 11,023.7 |
| Total 8/ | 7,769.4 | 21,059.8 | 62,726.2 | 32,342.1 | 78,495.6 | 55,077.2 | 33,963.4 | 131,852.7 | 36,431.8 | 368,162.8 |

1/ Includes miles of road maintained at a level consistent with current uses.
2/ Includes miles of road maintained at a level less than adequate for current uses.
3/ Roads closed to motorized traffic.
4/ Roads maintained for use by high clearance vehicles.
5/ Roads maintained for passenger car use.
6/ Road mile increase includes roads acquired through land and right-of-way purchases, inventory revisions and new construction.
7/ Includes Tongass Timber Supply Fund, $172,200, 415.3 miles fully maintained and 538.8 miles lacking full maintenance.
8/ Does not include $1,197,328 of Washington Office funds.

Photo by SSgt. Michael Best, U.S. Air Force

**Table 44–State and Private Forestry funding--fiscal year 1991 compared to long-term program costs**

| | 1991 Actual | 1995 RPA 1/ | Percent of 1991 Actual to 1995 RPA |
|---|---|---|---|
| | | *1,000 constant 1991 dollars* | |
| Appropriated accounts | | | |
| Forest pest mangement | 60,150 | 66,560 2/ | 90 |
| Fire protection | 15,749 | 20,800 | 76 |
| Forest management and utilization | 74,206 | 196,560 | 38 |
| Special projects | 32,309 | - 3/ | N/A 4/ |
| Subtotal | 182,414 | 283,920 | 64 |
| Transfer accounts | | | |
| Rural community fire protection | 3,500 | - 5/ | N/A |
| Watershed and flood prevention | 2,181 | - | N/A |
| Watershed planning | 228 | - | N/A |
| Resource conservation and development | 653 | - | N/A |
| River basin surveys and investigations | 850 | - | N/A |
| Forestry Incentives Program 6/ | 1,245 | - | N/A |
| Agricultural Conservation Program 6/ | 1,824 | - | N/A |
| Subtotal | 10,481 | - | N/A |
| Total | 192,895 | N/A | N/A |

1/ Information from 1990 RPA Program
2/ Includes both cooperative and Federal pest management.
3/ Included in forest management and utilization.
4/ Not applicable.
5/ Not reported in the 1990 RPA.
6/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS).

**Table 45–State and Private Forestry funding--fiscal years 1987-91**

| | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 dollars actual* | | |
| Appropriated accounts | | | | | |
| Forest pest management | 60,150 | 47,586 | 49,677 | 44,441 | 38,462 |
| Fire protection | 15,749 | 17,078 | 13,851 | 13,770 | 13,661 |
| Forest management and utilization | 74,206 | 25,321 | 10,265 | 10,783 | 10,026 |
| Special projects | 32,309 | 19,663 | 12,875 | 10,875 | 4,405 |
| Subtotal | 182,414 | 109,648 | 86,668 | 79,869 | 66,554 |
| Transfer accounts | | | | | |
| Rural community fire protection | 3,500 | 3,091 | 3,091 | 3,091 | 3,091 |
| Watershed and flood prevention | 2,181 | 2,698 | 3,198 | 2,777 | 3,884 |
| Watershed planning | 228 | 228 | 228 | 241 | 211 |
| Resource conservation and development | 653 | 724 | 766 | 803 | 643 |
| River basin surveys and investigations | 850 | 852 | 852 | 852 | 869 |
| Forestry Incentives Program 1/ | 1,245 | 1,245 | 1,245 | 1,189 | 1,218 |
| Agricultural Conservation Program 1/ | 1,824 | 1,730 | 1,769 | 1,769 | 1,800 |
| Subtotal | 10,481 | 10,568 | 11,149 | 10,722 | 11,716 |
| Total | 192,895 | 120,216 | 97,817 | 90,591 | 78,270 |

1/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS).

F.S Photo

**Table 46—Summary of State and Private Forestry 1991 accomplishments compared to long-term program levels**

| | Unit of measure 2/ | 1991 Actual | 1991 Funded | Percent of 1991 Actual to 1991 Funded | 1990 Actual | 1995 1/ RPA | Percent change comparison: 1990 Actual to 1991 Actual | Percent change comparison: 1991 Actual to 1995 RPA |
|---|---|---|---|---|---|---|---|---|
| Appropriated accounts | | | | | | | | |
| Forest pest management 3/ | | | | | | | | |
| Insect and disease management surveys | MM acres | 692 | 666 | 104 | 595 | N/A | 16 | N/A |
| Insect and disease suppression | MM acres | 1.5 | - 4/ | - | 1.7 | N/A | -12 | N/A |
| Insect and disease special projects | Projects | 39 | - | - | 35 | N/A | 11 | N/A |
| Forest management and utilization | | | | | | | | |
| Forest resource management | | | | | | | | |
| Forest Land management plans | MM acres | 4.1 | 4 | 103 | 3.5 | 9 | 17 | 120 |
| Timber harvested | MM cubic feet | 200 | - | - | 384 | N/A | -48 | N/A |
| Reforestation 5/ | M acres | 1100 | - | - | 887 | 1,300 | 24 | 18 |
| Timber stand improvement 6/ | M acres | 257 | - | - | 187 | 870 | 37 | 239 |
| Woodland owners assisted | M owners | 153 | - | - | 149 | N/A | 3 | N/A |
| Wood utilization | MM cubic feet | - | - | - | - | N/A | - | N/A |
| Seedling, nursery, and tree improvement | MM seedlings | 483 | - | - | 550 | N/A | -12 | N/A |
| Urban forestry assistance | Areas assisted | 11067 7/ | - | - | 8,736 | N/A | 27 | N/A |
| Management improvement | | | | | | | | |
| State forest resource planning | Person Years | 28 | - | - | 27 8/ | N/A | 4 | N/A |
| Transfer accounts | | | | | | | | |
| Rural community fire protection, FmHA | M approved applications | 3.5 | 3.3 | 106 | 3.4 | N/A | 3 | N/A |
| Watershed and flood prevention, SCS 9/ | Projects | 25 | 25 | 100 | 70 | N/A | -64 | N/A |
| Watershed planning, SCS | Plans | 30 | 30 | 100 | 66 | N/A | -55 | N/A |
| Resource conservation and development, SCS | Projects | 54 | 54 | 100 | 60 | N/A | -10 | N/A |
| River basin surveys and investigations, SCS | Plans | 51 | 51 | 100 | 49 | N/A | 4 | N/A |
| Forestry Incentives Program, ASCS 10/ | | | | | | | | |
| Reforestation | M acres | 150 | - | - | 161 | N/A 11/ | -7 | N/A |
| Timber stand improvement | M acres | 31 | - | - | 30 | N/A | 3 | N/A |
| Agricultural Conservation Program, ASCS 10/ | | | | | | | | |
| Reforestation | M acres | 110 | - | - | 144 | N/A | -24 | N/A |
| Timber stand improvement | M acres | 38 | - | - | 39 | N/A | -3 | N/A |

1/ Information from 1990 RPA Program.
2/ M = thousand, MM = million.
3/ Includes accomplishments on National Forest System and other Federal lands, as well as State and private lands.
4/ -- = not applicable.
5/ Includes Conservation Reserve Program, Forestry Incentives Program and Agricultural Conservation Program accomplishments.
6/ Includes Forestry Incentives Program and Agricultural Conservation Program accomplishments.
7/ Areas represent more than one assistance per community; e.g., New York, Philadelphia, etc.
8/ Includes Emergency Watershed Protection.
9/ Accomplishments for 1991 are estimates; actual data is not available from SCS.
10/ Same as footnote 9, except for agency.
11/ Not available.

**Table 47–Summary of forest stewardship program accomplishments by State--fiscal years 1990-1991**

| State or territory 1/ | 1990 plans 2/ | 1990 acres | 1991 plans 2/ | 1991 acres | Cumulative plans 2/ | Cumulative acres |
|---|---|---|---|---|---|---|
| Alabama | 143 | 18,219 | 113 | 9,602 | 256 | 27,821 |
| Alaska | 40 | 155,680 | 44 | 191,000 | 84 | 346,680 |
| Arizona | 3 | 54,565 | 2 | 135,000 | 5 | 189,565 |
| Arkansas | 0 | 0 | 20 | 7,166 | 20 | 7,166 |
| California | 0 | 85 | 36 | 14,320 | 36 | 14,405 |
| Colorado | 9 | 21,900 | 118 | 56,558 | 127 | 78,458 |
| Delaware | 0 | 0 | 70 | 3,750 | 70 | 3,750 |
| Florida | 12 | 27,519 | 57 | 63,811 | 69 | 91,330 |
| Georgia | 2 | 1,464 | 44 | 61,106 | 46 | 62,570 |
| Guam | 2 | 11 | 10 | 6 | 12 | 17 |
| Hawaii | 2 | 50 | 1 | 50 | 3 | 100 |
| Idaho | 85 | 7,100 | 177 | 12,338 | 262 | 19,438 |
| Illinois | 170 | 11,204 | 503 | 61,708 | 673 | 72,912 |
| Indiana | 1,392 | 52,585 | 486 | 17,158 | 1,878 | 69,743 |
| Iowa | 230 | 4,440 | 588 | 13,800 | 818 | 18,240 |
| Kansas | 52 | 2,080 | 59 | 2,061 | 111 | 4,141 |
| Kentucky | 327 | 24,500 | 867 | 77,994 | 1,194 | 102,494 |
| Louisiana | 0 | 0 | 10 | 479 | 10 | 479 |
| Maine | 0 | 0 | 67 | 41,312 | 67 | 41,312 |
| Maryland | 174 | 5,965 | 110 | 7,148 | 284 | 13,113 |
| Massachusetts | 171 | 20,390 | 524 | 42,666 | 695 | 63,056 |
| Michigan | 5 | 147 | 100 | 6,000 | 105 | 6,147 |
| Minnesota | 549 | 56,382 | 698 | 65,743 | 1,247 | 122,125 |
| Mississippi | 159 | 35,721 | 234 | 59,194 | 393 | 94,915 |
| Missouri | 300 | 28,971 | 323 | 38,936 | 623 | 67,907 |
| Montana | 0 | 0 | 17 | 2,600 | 17 | 2,600 |
| Nebraska | 0 | 0 | 50 | 9,811 | 50 | 9,811 |
| Nevada | 3 | 10,260 | 9 | 12,700 | 12 | 22,960 |
| New Hampshire | 306 | 21,600 | 237 | 48,418 | 543 | 70,018 |
| New Mexico | 0 | 0 | 1 | 7,000 | 1 | 7,000 |
| New York | 1,814 | 112,445 | 1,574 | 117,993 | 3,388 | 230,438 |
| North Carolina | 2 | 1,360 | 62 | 15,644 | 64 | 17,004 |
| North Dakota | 39 | 1,740 | 137 | 9,343 | 176 | 11,083 |
| Ohio | 1,286 | 39,984 | 1,151 | 40,161 | 2,437 | 80,145 |
| Oklahoma | 10 | 8,158 | 12 | 4,836 | 22 | 12,994 |
| Oregon | 4 | 2,502 | 84 | 20,598 | 88 | 23,100 |
| Rhode Island | 0 | 0 | 33 | 991 | 33 | 991 |
| South Carolina | 0 | 0 | 14 | 2,448 | 14 | 2,448 |
| South Dakota | 126 | 1,034 | 17 | 508 | 143 | 1,542 |
| Tennessee | 0 | 0 | 60 | 11,222 | 60 | 11,222 |
| Texas | 150 | 18,000 | 359 | 30,542 | 509 | 48,542 |
| Utah | 17 | 5,822 | 7 | 6,160 | 24 | 11,982 |
| Vermont | 10 | 1,350 | 214 | 24,930 | 224 | 26,280 |
| Virginia | 0 | 0 | 170 | 33,776 | 170 | 33,776 |
| Washington | 7 | 1,692 | 216 | 13,337 | 223 | 15,029 |
| West Virginia | 172 | 30,286 | 515 | 45,986 | 687 | 76,272 |
| Wisconsin | 635 | 41,312 | 1,806 | 113,792 | 2,441 | 155,104 |
| Wyoming | 347 | 12,880 | 13 | 11,742 | 360 | 24,622 |
| Total | 8,755 | 839,403 | 12,019 | 1,573,444 | 20,774 | 2,412,847 |

1/ States not listed had no data.
2/Landowner forest stewardship plans.

**Table 48–Summary of selected cooperative forest management and processing program activities--selected fiscal years**

| | Woodland owners assisted | Timber sale assistance-- volume marked | Loggers and processors assisted |
|---|---|---|---|
| | | *MBF 1/* | |
| 1945 | 8,093 | 411,330 | 0 |
| 1950 | 22,828 | 518,566 | 0 |
| 1955 | 34,828 | 549,373 | 8,182 |
| 1960 | 82,188 | 569,178 | 8,099 |
| 1965 | 99,074 | 716,950 | 9,248 |
| 1970 | 115,197 | 1,225,520 | 13,620 |
| 1971 | 127,828 | 860,950 | 14,627 |
| 1972 | 274,001 | 955,627 | 5,290 |
| 1973 | 106,422 | 1,578,664 | 4,855 |
| 1974 | 117,990 | 907,311 | 5,353 |
| 1975 | 140,940 | 677,532 | 5,405 |
| 1976 | 105,184 | 596,599 | 15,318 |
| 1976 -77 (T.Q.) 2/ | 25,253 | 220,649 | 5,849 |
| 1977 | 133,619 | 921,171 | 29,101 |
| 1978 | 165,329 | 1,120,743 | 12,749 |
| 1979 | 183,585 | 755,103 | 11,393 |
| 1980 | 176,385 | 870,964 | 11,582 |
| 1981 | 164,279 | 683,181 | 18,609 |
| 1982 | 141,472 | 841,475 | 15,470 |
| 1983 | 136,265 | 872,125 | 8,717 |
| 1984 | 151,539 | 1,033,440 | 10,082 3/ |
| 1985 | 134,338 | 913,411 | - 4/ |
| 1986 | 137,753 | 855,813 | - 4/ |
| 1987 | 158,353 | 1,225,896 | - 4/ |
| 1988 | 167,432 | 890,581 | - 4/ |
| 1989 | 153,855 | 1,242,564 | - 4/ |
| 1990 | 148,673 | 1,597,931 | - 4/ |
| 1991 | 153,090 | 1,697,861 | - 4/ |

1/ MBF = thousand board feet.
2/ Transition quarter.
3/ Not all states reported.
4/ Inadequate data due to lack of State grants in wood utilization program.

**Table 49–Summary of selected cooperative forest management and processing activities by Region--fiscal year 1991**

| Assistance activity | Unit of measure 1/ | Regions | | | | |
|---|---|---|---|---|---|---|
| | | Northern | Rocky Mountain | South-western | Inter-mountain | Pacific Southwest |
| Woodland owners assisted | Number | 7,539 | 3,755 | 203 | 790 | 3,934 |
| Forest management plans prepared | Number | 634 | 800 | 39 | 37 | 183 |
| | Acres | 44,417 | 113,727 | 135,909 | 23,220 | 28,544 |
| Reforestation: | | | | | | |
| Planting | Acres | 1,552 | 1,442 | 365 | 413 | 24,715 |
| Seeding | Acres | 0 | 0 | 0 | 0 | 6 |
| Management for natural regeneration | Acres | 418 | 2,151 | 5,994 | 268 | 15,316 |
| Timber stand improvement | Acres | 2,999 | 2,900 | 202 | 3,230 | 4,194 |
| Outdoor recreation development | Acres | 836 | 3,776 | 5,903 | 1,700 | 980 |
| Wildlife habitat development | Acres | 610 | 4,158 | 6,828 | 2,800 | 8,678 |
| Forested range improvement | Acres | 110 | 2,646 | 5,644 | 3,000 | 2,092 |
| Timber sale assistance volume harvested | M cubic feet | 10,133 | 2,737 | 5,169 | 590 | 3,050 |
| Urban forestry assistance activities | Urban areas assisted | 263 | 1,220 | 52 | 63 | 1,116 |
| Referrals to consulting foresters | Number | 69 | 193 | 28 | 19 | 666 |

See footnote at end of table.

F.S. Photo

**Table 49–Summary of selected cooperative forest management and processing activities by Region--fiscal year 1991--Continued**

| Assistance activity | Unit of measure 1/ | Regions | | | | |
|---|---|---|---|---|---|---|
| | | Pacific Northwest | Alaska | Southern | Northeastern Area | Total |
| Woodland owners assisted | Number | 8,517 | 43 | 50,884 | 77,425 | 153,090 |
| Forest management plans prepared | Number | 1,270 | 43 | 46,632 | 18,061 | 67,699 |
| | Acres | 52,703 | 195,000 | 2,387,957 | 1,116,602 | 4,098,079 |
| Reforestation: | | | | | | |
| Planting | Acres | 29,014 | 696 | 565,077 | 80,919 | 704,193 |
| Seeding | Acres | 0 | 540 | 25,065 | 532 | 26,143 |
| Management for natural regeneration | Acres | 7,867 | 417 | 49,884 | 33,601 | 115,916 |
| Timber stand improvement | Acres | 24,921 | 80 | 133,524 | 84,560 | 256,610 |
| Outdoor recreation development | Acres | 420 | 0 | 129,157 | 74,876 | 217,648 |
| Wildlife habitat development | Acres | 827 | 0 | 413,793 | 192,719 | 630,413 |
| Forested range improvement | Acres | 757 | 0 | 61,097 | 4,001 | 79,347 |
| Timber sale assistance volume harvested | M cubic feet | 2,644 | 200 | 121,049 | 96,827 | 242,399 |
| Urban forestry assistance activities | Urban areas assisted | 374 | 16 | 2,660 | 5,303 | 11,067 |
| Referrals to consulting foresters | Number | 118 | 1 | 6,572 | 7,997 | 15,663 |

1/ M = thousand.

F S. Photo

**Table 50–Summary of selected cooperative forest management and processing activities by State--fiscal year 1991**

| State, Commonwealth, or Territory 1/ | Woodland owners assisted | Reforestation assistance | Timber stand improvement assistance | Timber sale assistance--harvest volume | State nursery production |
|---|---|---|---|---|---|
| | | *Acres* | *Acres* | *1,000 cubic feet* | *1,000 trees* |
| Alabama | 0 | 112,328 | 46,333 | 0 | 29,490 |
| Alaska | 43 | 1,653 | 80 | 200 | 0 |
| American Samoa | 251 | 8 | 0 | 0 | 8 |
| Arizona | 145 | 5,217 | 95 | 1,796 | 0 |
| Arkansas | 1,651 | 25,796 | 1,998 | 733 | 11,307 |
| California | 3,284 | 39,505 | 3,524 | 3,050 | 2,887 |
| Colorado | 1,564 | 1,417 | 280 | 1,980 | 2,170 |
| Com. of N. Marianas | 5 | 25 | 0 | 0 | 6 |
| Connecticut | 615 | 716 | 404 | 0 | 1,200 |
| Delaware | 385 | 1,026 | 16 | 250 | 0 |
| Florida | 3,711 | 43,633 | 9,038 | 0 | 23,264 |
| Georgia | 9,411 | 79,089 | 21,771 | 0 | 50,861 |
| Guam | 46 | 55 | 30 | 0 | 44 |
| Hawaii | 234 | 382 | 347 | 0 | 420 |
| Idaho | 5,455 | 1,309 | 2,425 | 720 | 747 |
| Illinois | 16,848 | 8,032 | 5,723 | 1,141 | 4,598 |
| Indiana | 2,915 | 5,199 | 8,879 | 1,961 | 5,567 |
| Iowa | 1,936 | 9,105 | 4,643 | 510 | 3,873 |
| Kansas | 551 | 209 | 154 | 116 | 84 |
| Kentucky | 1,392 | 4,677 | 1,749 | 0 | 7,808 |
| Louisiana | 2,189 | 35,272 | 1,604 | 0 | 34,911 |
| Maine | 3,582 | 2,669 | 2,394 | 47 | 0 |
| Maryland | 2,636 | 7,019 | 3,504 | 1,167 | 4,811 |
| Massachusetts | 1,365 | 11,182 | 2,193 | 11,522 | 0 |
| Michigan | 1,208 | 12,065 | 27,702 | 9,759 | 3,065 |
| Minnesota | 68 | 15,683 | 2,169 | 12,530 | 15,856 |
| Mississippi | 16,064 | 116,692 | 19,256 | 0 | 45,916 |
| Missouri | 1,632 | 2,882 | 1,916 | 2,650 | 4,730 |
| Montana | 744 | 487 | 564 | 9,381 | 1,152 |
| Nebraska | 673 | 230 | 71 | 4 | 2,896 |
| Nevada | 570 | 300 | 3,200 | 256 | 180 |
| New Hampshire | 10,970 | 522 | 672 | 410 | 425 |
| New Jersey | 1,018 | 2,328 | 1,594 | 899 | 620 |
| New Mexico | 58 | 1,142 | 107 | 3,373 | 30 |
| New York | 2,561 | 2,976 | 2,303 | 6,484 | 3,500 |
| North Carolina | 6,468 | 86,911 | 3,577 | 0 | 26,892 |
| North Dakota | 1,340 | 174 | 10 | 32 | 1,149 |
| Ohio | 10,740 | 4,644 | 5,686 | 2,443 | 6,164 |
| Oklahoma | 812 | 1,222 | 875 | 0 | 3,137 |
| Oregon | 7,358 | 23,714 | 19,719 | 2,644 | 20,196 |
| Other Pacific Islands | 111 | 59 | 285 | 0 | 22 |
| Palau | 3 | 3 | 8 | 0 | 6 |
| Pennsylvania | 2,429 | 861 | 1,456 | 780 | 2,803 |
| Rhode Island | 163 | 230 | 353 | 671 | 0 |
| South Carolina | 4,726 | 34,007 | 5,300 | 0 | 29,177 |
| South Dakota | 715 | 512 | 514 | 312 | 1,437 |
| Tennessee | 2,190 | 4,401 | 80 | 2,439 | 5,993 |
| Texas | 2,270 | 22,024 | 2,711 | 4,144 | 23,887 |
| Utah | 220 | 381 | 30 | 334 | 400 |
| Vermont | 5,441 | 775 | 2,774 | 13,576 | 620 |

See footnote at end of table.

**Table 50–Summary of selected cooperative forest management and processing activities by State--fiscal year 1991--Continued**

| State, Commonwealth, or Territory 1/ | Woodland owners assisted | Reforestation assistance | Timber stand improvement assistance | Timber sale assistance--harvest volume | State nursery production |
|---|---|---|---|---|---|
| | | *Acres* | *Acres* | *1,000 cubic feet* | *1,000 trees* |
| Virginia | 0 | 73,974 | 19,232 | 113,733 | 59,670 |
| Washington | 1,159 | 13,167 | 5,202 | 0 | 12,001 |
| West Virginia | 3,484 | 4,534 | 1,984 | 2,654 | 1,742 |
| Wisconsin | 7,429 | 22,604 | 8,195 | 27,373 | 20,618 |
| Wyoming | 252 | 1,225 | 1,881 | 325 | 0 |
| Total | 153,090 | 846,252 | 256,610 | 242,399 | 478,340 |

1/ States not listed have no cooperative forest management and processing activities.

Photo by Tom Iraci

**Table 51–Small watershed protection accomplishments--fiscal years 1987-91 (P.L. 83-566, Act of 1954) 1/**

| | Unit of measure | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|---|
| Land treatment 2/ | | | | | | |
| Forest land | Acres | 26,967 | 10,477 | 8,735 | 9,692 | 5,462 |
| Cropland | Acres | 745 | 279 | 2,395 | 2,079 | 1,061 |
| Pastureland | Acres | 728 | 308 | 156 | 831 | 424 |
| Total land treatment | Acres | 28,440 | 11,064 | 11,286 | 12,602 | 6,947 |
| Land owners assisted | Number | 1,990 | 1,144 | 1,238 | 1,068 | 372 |

1/ Accomplishments are limited to activities accomplished soley by small watershed protection program funds.
2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

**Table 52–Flood prevention accomplishments--fiscal years 1987-91 (P.L. 78-534, Act of 1944) 1/**

| | Unit of measure | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|---|
| Land treatment 2/ | | | | | | |
| Forest land | Acres | 11,700 | 4,457 | 15,349 | 6,742 | 6,399 |
| Cropland | Acres | - | 970 | 253 | 454 | 793 |
| Pastureland | Acres | - | 188 | 259 | 182 | 317 |
| Total land treatment | Acres | 11,700 | 5,615 | 15,861 | 7,378 | 7,509 |
| Land owners assisted | Number | 1,920 | 2,116 | 2,091 | 2,932 | 5,113 |

1/ Accomplishments are limited to activities accomplished soley by small watershed protection program funds.
2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

**Table 53–Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)--calendar year 1990**

| State, Commonwealth, or Territory | Acres protected | Lightening fires | Person-caused fires | Total fires | Acres burned |
|---|---|---|---|---|---|
| | *1,000 acres* | *Number* | *Number* | *Number* | *Number* |
| Alabama | 26,436,126 | 124 | 6,440 | 6,564 | 47,746 |
| Alaska | 487,126,136 | 388 | 357 | 745 | 3,125,292 |
| Arizona | 62,683,734 | 1,291 | 997 | 2,288 | 70,524 |
| Arkansas | 21,420,888 | 87 | 2,616 | 2,703 | 34,971 |
| California | 76,680,370 | 2,801 | 8,153 | 10,954 | 300,051 |
| Colorado | 49,810,023 | 958 | 1,347 | 2,305 | 19,976 |
| Connecticut | 2,398,000 | 0 | 512 | 512 | 1,297 |
| Delaware | 582,400 | 0 | 23 | 23 | 788 |
| Florida | 28,981,791 | 1,509 | 5,474 | 6,983 | 288,542 |
| Georgia | 28,669,617 | 829 | 8,378 | 9,207 | 68,036 |
| Guam | 81,643 | 0 | 639 | 639 | 4,428 |
| Hawaii | 3,843,900 | 2 | 257 | 259 | 19,539 |
| Idaho | 38,807,765 | 1,165 | 435 | 1,600 | 128,457 |
| Illinois | 11,053,435 | 2 | 510 | 512 | 6,020 |
| Indiana | 7,536,805 | 1 | 205 | 206 | 954 |
| Iowa | 7,691,400 | 0 | 968 | 968 | 3,627 |
| Kansas | 19,952,489 | 130 | 4,983 | 5,113 | 97,691 |
| Kentucky | 12,399,635 | 2 | 1,383 | 1,385 | 23,457 |
| Louisiana | 13,252,764 | 36 | 4,710 | 4,746 | 53,759 |
| Maine | 18,038,460 | 22 | 520 | 542 | 1,249 |
| Maryland | 3,592,600 | 22 | 468 | 490 | 3,558 |
| Massachusetts | 3,644,300 | 10 | 5,353 | 5,363 | 4,613 |
| Michigan | 24,275,495 | 15 | 492 | 507 | 9,292 |
| Minnesota | 27,042,418 | 43 | 2,423 | 2,466 | 164,043 |
| Mississippi | 21,262,729 | 54 | 6,775 | 6,829 | 79,677 |
| Missouri | 18,139,566 | 23 | 3,208 | 3,231 | 48,037 |
| Montana | 83,729,714 | 931 | 927 | 1,858 | 106,375 |
| Nebraska | 49,807,424 | 98 | 1,592 | 1,690 | 42,833 |
| Nevada | 62,298,225 | 432 | 243 | 675 | 38,079 |
| New Hampshire | 5,717,612 | 2 | 364 | 366 | 489 |
| New Jersey | 3,243,000 | 4 | 1,232 | 1,236 | 2,692 |
| New Mexico | 70,953,334 | 821 | 821 | 1,642 | 161,538 |
| New York | 18,449,706 | 8 | 336 | 344 | 1,663 |
| North Carolina | 21,780,797 | 144 | 3,928 | 4,072 | 30,850 |
| North Dakota | 35,206,650 | 33 | 719 | 752 | 15,589 |
| Ohio | 6,061,381 | 0 | 475 | 475 | 1,818 |
| Oklahoma | 6,795,742 | 17 | 1,615 | 1,632 | 35,703 |
| Oregon | 48,762,223 | 1,829 | 1,139 | 2,968 | 149,404 |
| Pennsylvania | 20,152,623 | 7 | 837 | 844 | 16,024 |
| Puerto Rico | 1,080,200 | 0 | 7,354 | 7,354 | 11,797 |
| Rhode Island | 434,300 | 0 | 142 | 142 | 173 |
| South Carolina | 15,074,568 | 268 | 5,668 | 5,936 | 27,189 |
| South Dakota | 31,651,233 | 828 | 452 | 1,280 | 17,832 |
| Tennessee | 25,673,842 | 24 | 2,321 | 2,345 | 16,128 |
| Texas | 24,344,218 | 43 | 1,706 | 1,749 | 50,318 |
| Utah | 49,381,525 | 639 | 345 | 984 | 42,492 |
| Vermont | 4,946,065 | 0 | 142 | 142 | 389 |
| Virginia | 15,761,875 | 23 | 1,061 | 1,084 | 4,397 |
| Washington | 26,729,045 | 891 | 1,236 | 2,127 | 19,221 |
| West Virginia | 16,505,634 | 2 | 894 | 896 | 14,968 |
| Wisconsin | 21,161,915 | 20 | 2,165 | 2,185 | 7,395 |
| Wyoming | 60,796,162 | 401 | 444 | 845 | 33,720 |
| Total | 1,741,903,502 | 16,979 | 105,784 | 122,763 | 5,454,700 |

Photo by Tom Iraci

**Table 54–Forest Research funding--fiscal year 1991 compared to long-term program trends**

| | 1991 Actual | 1995 RPA 1/ | Percent of 1991 Actual to 1995 RPA |
|---|---|---|---|
| | *1,000 constant 1991 dollars* | | |
| Appropriated funds | | | |
| Forest protection research | 38,195 | 55,120 | 69 |
| Resource analysis research | 29,414 | 40,560 | 73 |
| Forest management and utilization research | 59,301 2/ | 71,760 | 83 |
| Forest environment research | 40,717 | 59,280 | 69 |
| Special projects, competitive grants | 0 | - 3/ | N/A 4/ |
| Research Challenge Cost-Share program | 0 | - | N/A |
| Subtotal | 167,627 | 226,720 | 74 |
| Research construction | 18,374 | - | N/A |
| Total, appropriated accounts | 186,001 | - | N/A |
| Reimbursable accounts | 10,572 | - | N/A |
| Grand total | 196,573 | N/A | N/A |

1/ Information from 1990 RPA Program.
2/ Actual 1991 funding for forest management plus forest products and harvesting research.
3/ Not reported in the RPA Program.
4/ Not applicable.

F S Photo

Table 55–Forest Research funding--fiscal years 1987-91 1/

| | 1991 | 1990 2/ | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 actual dollars* | | |
| Appropriated funds | | | | | |
| Forest protection research | 38,196 | 34,742 | 33,181 | 31,490 | 31,224 |
| Resource analysis research | 29,414 | 27,052 | 25,617 | 25,353 | 24,644 |
| Forest management research | 36,562 | 32,216 | 26,972 | 26,548 | 23,891 |
| Forest environment research | 40,718 | 35,313 | 31,100 | 29,259 | 28,154 |
| Forest products and harvesting research | 22,739 | 21,602 | 20,497 | 19,860 | 18,808 |
| Special projects, competitive grants 3/ | 0 | 0 | 0 | (3,000) | (6,000) |
| Research Challenge Cost-Share program | 0 | 0 | 500 4/ | 0 | 0 |
| Subtotal | 167,629 | 150,925 | 137,867 | 132,510 | 126,721 |
| Research construction (subtotal) | 18,374 | 4,408 | 1,550 | 2,908 | 343 |
| Total, appropriated accounts | 186,003 | 155,333 | 139,417 | 135,418 | 127,064 |
| Reimbursable accounts (subtotal) | 10,572 | 10,253 | 12,346 | 14,152 | 11,329 |
| Grand total | 196,575 | 165,586 | 151,763 | 149,570 | 138,393 |

1/ Budget structure was revised in fiscal year 1989 into five major budget line items. General Administration has been eliminated from individual line items. Total appropriated General Administration is included in tables 2 and 3.
2/ Post sequestration with supplemental.
3/ New account in 1985. Funds are transferred to the Competitive Research Grants Office, Cooperative State Research Service, Department of Agriculture, which administers the competitive grants research program.
4/ New account in 1989; $100,000 funded within each BLI for fiscal year 1989.

F.S Photo

**Table 56–Extramural research funded through Forest Service research appropriations--fiscal years 1990-91**

| Type of recipient | 1991 | | 1990 | |
|---|---|---|---|---|
| | *1,000 dollars* | *Number of grants* | *1,000 dollars* | *Number of grants* |
| Domestic grantees | | | | |
| Universities and colleges: | | | | |
| Land Grant research institutions | 13,099 | 511 | 9509 | 388 |
| 1890 Land Grant and predominately black institutions | 1,242 | 40 | 340 | 18 |
| Other non-Land Grant institutions | 2,125 | 93 | 1820 | 53 |
| Subtotal, universities and colleges | 16,466 | 644 | 11,669 | 459 |
| Other domestic | | | | |
| Profit organizations | 193 | 5 | 0 | 0 |
| Nonprofit institutions and organizations | 1,074 | 36 | 774 | 21 |
| Federal, State, and local governments | 506 | 17 | 404 | 19 |
| Private individuals | 210 | 16 | 65 | 5 |
| Small business innovation research | 62 | 4 | 231 | 13 |
| Subtotal, other domestic | 2,045 | 78 | 1,474 | 58 |
| Total, domestic | 18,511 | 722 | 13,143 | 517 |
| Foreign grantees | | | | |
| Universities and colleges | 129 | 9 | 52 | 5 |
| Nonprofit institutions and organizations | 85 | 3 | 0 | 0 |
| Private individuals | 25 | 4 | 24 | 2 |
| Total, foreign grantees | 239 | 16 | 76 | 7 |
| Grand total | 18,750 | 738 | 13,219 | 524 |

Table 57–Research publications by major subject area--fiscal years 1988-91

| | Number of publications | | | | RPA Theme |
|---|---|---|---|---|---|
| | 1991 | 1990 | 1989 | 1988 | Crosswalk 1/ |
| Environmental Research 2/ | | | | | |
| Watershed management | 126 | 112 | 96 | 156 | 1 |
| Wildlife | 204 | 121 | 147 | 156 | 1 |
| Range | 79 | 51 | 59 | 82 | 1 |
| Fisheries habitat | 46 | 27 | 17 | 38 | 1 |
| Disturbed areas rehabilitation | 19 | 51 | 50 | 33 | 2 |
| Atmospheric deposition and air pollution | 15 | 180 | 123 | 59 | 4 |
| Subtotal | 489 | 542 | 492 | 524 | |
| Insect and Disease Research | | | | | |
| Insect detection and evaluation | 46 | 42 | 34 | 52 | 3 |
| Insect biology | 77 | 43 | 57 | 44 | 3 |
| Insect control and management strategies | 58 | 92 | 69 | 63 | 3 |
| Disease detection and evaluation | 31 | 37 | 43 | 19 | 3 |
| Disease biology | 61 | 68 | 44 | 54 | 3 |
| Disease control and management strategies | 23 | 55 | 31 | 51 | 3 |
| Mycorrhizae | 11 | 24 | 25 | 42 | 3 |
| Wood products organisms | 30 | 22 | 25 | 14 | 3 |
| Subtotal | 337 | 383 | 328 | 339 | |
| Fire and Atmospheric Sciences Research 2/ | | | | | |
| Fire prevention, hazard reduction, and prescribed burning | - | 22 | - | 35 | - |
| Fire management methods and systems | - | 16 | - | 27 | - |
| Fire physics, chemistry (science) and behavior | 23 | 13 | 7 | 14 | 3 |
| Fire economics and management | 45 | 8 | 15 | - | 3 |
| Fire ecological relations and effects | 32 | 25 | 34 | 37 | 3 |
| Meteorology and climatology | 31 | 21 | 19 | 10 | 3 |
| Air resource management | 20 | - | 13 | - | 3 |
| Global change 3/ | 36 | - | - | - | 4 |
| Subtotal | 187 | 105 | 88 | 123 | |
| Forest Management Research | | | | | |
| Forest biology | 268 | 90 | 118 | 173 | 3 |
| Silviculture and management | 200 | 160 | 176 | 153 | 2 |
| Growth and yield | 45 | 92 | 83 | 127 | 2 |
| Genetics and tree improvement | 61 | 65 | 89 | 72 | 3 |
| Subtotal | 574 | 407 | 466 | 525 | |
| Economics, Marketing and Recreation Research | | | | | |
| Forest resource inventory and analysis | 107 | 120 | 109 | 203 | 2 |
| Forest economics | 142 | 159 | 190 | 131 | 2 |
| Forest recreation | 86 | 82 | 54 | 44 | 1 |
| Urban and community forestry | 46 | 58 | 17 | 31 | 4 |
| Subtotal | 381 | 419 | 370 | 409 | |

See footnotes at end of table.

**Table 57–Research publications by major subject area--fiscal years 1988-91--Continued**

| | Number of publications | | | | RPA Theme |
|---|---|---|---|---|---|
| | 1991 | 1990 | 1989 | 1988 | Crosswalk 1/ |
| Products and Engineering Research | | | | | |
| Forest engineering systems | 50 | 46 | 40 | 57 | 2 |
| Wood structural engineering | 58 | 50 | 47 | 71 | 3 |
| Chemistry, fiber, and fuel products | 78 | 43 | 90 | 25 | 3 |
| Utilization potential and processing of wood | 79 | 99 | 54 | 77 | 2 |
| Protection of wood in use | 23 | 22 | 24 | 55 | 3 |
| Subtotal | 288 | 260 | 255 | 285 | |
| NAPAP and Forest Response Program 2/ | 106 | - | - | - | 4 |
| General | 42 | 49 | 79 | 22 | 3 |
| Subtotal | 148 | 49 | 79 | 22 | |
| Grand total | 2,404 | 2,165 | 2,078 | 2,227 | |

1/ RPA Theme crosswalk numbers are shown to identify which areas support each of the four themes:
1 - Research to enhance recreation, wildlife and fisheries resources;
2 - Research to provide for environmentally acceptable commodity production;
3 - Research to provide for improved scientific knowledge about natural resources; and
4 - Research to respond to global resource issues.

2/ In FY 1991, selected publications from Environmental Research and Fire and Atmospheric Research were included in a new category: National Acid Precipitation Assessment Program (NAPAP) and Forest Response Program.

3/ The Global Change category was added in FY 1991 to reflect the increased research emphasis in this subject area.

Photo by Ken Hammond

Photo by Ken Hammond

**Table 58–Number of paid employees by occupational category for selected fiscal years, as of September 30, 1991**

| Occupation | 1991 | 1990 | 1989 | 1985 | 1980 |
|---|---|---|---|---|---|
| Professional | 12,908 | 12,376 | 11,381 | 10,896 | 10,881 |
| Administrative | 4,409 | 4,211 | 4,105 | 3,340 | 2,714 |
| Technical | 23,302 | 22,020 | 23,096 | 24,007 | 26,902 |
| Clerical | 4,312 | 4,454 | 4,552 | 5,421 | 7,151 |
| Other | 884 | 914 | 944 | 321 | 851 |
| Wage System | 2,867 | 2,817 | 2,913 | 2,953 | 3,331 |
| Total | 48,682 | 46,792 | 46,991 | 46,938 | 51,830 |
| Full-time equivalents (FTE's) 1/ | 42,221 | 42,342 | 40,912 | 38,524 | 49,005 |

1/ One FTE equals 2,080 paid hours of employment. These data include emergency FTE's, which do not count against ceilings.

**Table 59–Number of paid employees by type of appointment for selected fiscal years, as of September 30, 1991**

| Type of Appointment | 1991 | 1990 | 1989 | 1985 | 1980 |
|---|---|---|---|---|---|
| Permanent 1/ | 34,861 | 33,781 | 32,467 | 32,924 | 37,236 |
| Temporary/Excepted 2/ | 13,821 | 13,011 | 14,524 | 14,014 | 14,594 |
| Total | 48,682 | 46,792 | 46,991 | 46,938 | 51,830 |

1/ Permanent are those employees who have career, or career-conditional, appointments.
2/ Temporary/excepted employees are any non-permanent employees who are paid from agency funds. Includes summer, seasonal, casual fire fighters, cooperative education, stay-in-school, and many other types of employees. Therefore, on September 30, 1991, there were 13,821 non-permanent paid employees. These data do not include some HRP Programs, such as volunteers (who are not paid salary) and the Senior Community Service Employment Program (who are paid by the Department of Labor).

**Table 60–Number and percent of permanent/excepted-conditional employees by race/national origin and gender as of September 30, 1991 1/**

| Race/National Origin | Women | Men | Total | Percent |
|---|---|---|---|---|
| American Indian/Alaskan Native | 672 | 959 | 1,631 | 4.6 |
| Asian/Pacific Islander | 254 | 231 | 485 | 1.4 |
| Black | 758 | 667 | 1,425 | 4.0 |
| Hispanic | 649 | 1,145 | 1,794 | 5.0 |
| White | 11,627 | 18,720 | 30,347 | 85.0 |
| Total | 13,960 | 21,722 | 35,682 | 100 |
| Percent by gender | 39.1 | 60.9 | 100 | |

1/ Excepted-conditional appointments are those which, after meeting certain requirements, may non-competitively become permanent appointments. Examples are cooperative education and disabilities programs.


F S Photo

**Table 61–Summary of Forest Service Human Resource Programs--fiscal year 1991**

| | Program funding | Value of work accomplished | Persons served | Percent | | Work accomplished 1/ | Percent placement | Return per dollar invested |
|---|---|---|---|---|---|---|---|---|
| | | | | Women | Minority | | | |
| | *Million dollars* | | | | | | | *Dollars* |
| Youth Conservation Corps 2/ | Unfunded | 3.4 | 1,230 | 43 | 20 | 192 | - 4/ | 1.88 |
| Job Corps 3/ | 65.7 | 20.7 | 9,139 | 13 | 42 | 3,884 | 86 | - 4/ |
| Senior Community Service Employment Program 3/ | 23.8 | 37.6 | 5,730 | 38 | 22 | 2,738 | 15 | 1.58 |
| Volunteers in the National Forests 5/ | Unfunded | 33.8 | 94,585 | 33 | 9 | 2,186 | - 4/ | - 4/ |
| Hosted programs | Unfunded | 18.9 | 23,936 | 12 | 42 | 1,229 | - 4/ | - 4/ |
| Total | 89.5 | 114.4 | 134,620 | - | - | 10,229 | - | - |

1/ Person years.
2/ Funds were not directly appropriated for Youth Conservation Corps; the Congress earmarked not less than $1 million to be expended from funds available to the Forest Service. We operated a $1.8 million YCC program.
3/ Statistics are for the July 1, 1990, through June 30, 1991, program year.
4/ -- = not applicable.
5/ Statistics include 3,311 Touch America Project (TAP) enrollees.

**Table 62–Summary statement of receipts and obligations--fiscal years 1990-91 1/**

| | 1991 | | 1990 | | Percent change 1990 to 1991 | |
|---|---|---|---|---|---|---|
| | Receipts | Obligations | Receipts | Obligations | Receipts | Obligations |
| National Forest programs | | | *1,000 constant 1991 dollars* | | | |
| Cash receipts: | | | | | | |
| Sale of timber and use of other forest resources | 744,824 | 0 | 975,572 | 0 | -24 | 0 |
| Use of National Grasslands & land utilization areas | 26,820 | 0 | 34,617 | 0 | -23 | 0 |
| Timber sale area betterment (K-V) 2/ | 197,399 | 0 | 214,749 | 0 | -8 | 0 |
| Cooperative work for others | 54,575 | 0 | 55,794 | 0 | -2 | 0 |
| Brush disposal | 40,468 | 0 | 49,006 | 0 | -17 | 0 |
| Miscellaneous (sales, rentals, damages, etc.) 3/ | 8,800 | 0 | 5,691 | 0 | 55 | 0 |
| Restoration of forest lands and improvements | 140 | 0 | 98 | 0 | 43 | 0 |
| Golden Eagle Passports | 6 | 0 | 8 | 0 | -28 | 0 |
| Timber salvage sales | 144,194 | 0 | 169,918 | 0 | -15 | 0 |
| Operation & maintenance of quarters | 6,364 | 0 | 6,319 | 0 | 1 | 0 |
| Gifts, donations, and bequests | 1,887 | 0 | 1,819 | 0 | 4 | 0 |
| Subtotal | 1,225,477 | 0 | 1,513,591 | 0 | -19 | 0 |
| Cash receipts from NFS lands collected in conjunction with, and deposited to, accounts of other agencies | 111,450 | 0 | 132,820 | 0 | -16 | 0 |
| Non-cash income (roads built by timber purchasers) | 104,579 | 0 | 109,059 | 0 | -4 | 0 |
| Total | 1,441,506 | 0 | 1,755,470 | 0 | -18 | 0 |
| Obligations | | | | | | |
| Operating costs | 0 | 2,202,589 | 0 | 2,939,004 | 0 | -25 |
| Capital outlay | 0 | 307,531 | 0 | 274,283 | 0 | 12 |
| Total | 0 | 2,510,120 | 0 | 3,213,287 | 0 | -22 |
| Other Forest Service programs | | | | | | |
| Forest Research programs: | | | | | | |
| Forest research | 0 | 175,688 | 0 | 157,158 | 0 | 12 |
| Research construction | 0 | 22,575 | 0 | 4,558 | 0 | 395 |
| Cooperative research work 4/ | 0 | 4,106 | 0 | 4,384 | 0 | -6 |
| Gifts, donations, and bequests for forest rangeland research | 31 | 1,251 | 3 | 1,894 | 894 | -34 |
| Tongass Timber Supply Fund | 0 | 1,493 | 0 | 1,608 | 0 | -7 |
| Subtotal | 31 | 205,113 | 3 | 169,602 | 894 | 21 |

See footnotes at end of table.

**Table 62–Summary statement of receipts and obligations--fiscal years 1990-91--Continued**

| | 1991 | | 1990 | | Percent change 1990 to 1991 | |
|---|---|---|---|---|---|---|
| | Receipts | Obligations | Receipts | Obligations | Receipts | Obligations |
| | | | *1,000 constant 1991 dollars* | | | |
| State and Private Forestry programs | | | | | | |
| State and Private Forestry cooperation | 0 | 159,370 | 0 | 119,527 | 0 | 33 |
| Rural community fire protection | 0 | 3,353 | 0 | 3,130 | 0 | 7 |
| Flood prevention and watershed protection | 0 | 3,125 | 0 | 3,131 | 0 | 0 |
| Licensee programs (Woodsy Owl and Smokey Bear) | 97 | -155 | 120 | 450 | -19 | -134 |
| Forestry Incentives and other programs 5/ | 0 | 1,754 | 0 | 1,943 | 0 | -10 |
| Subtotal | 97 | 167,447 | 120 | 128,182 | -19 | 31 |
| Human Resource programs | | | | | | |
| Job Corps | 0 | 67,689 | 0 | 65,486 | 0 | 3 |
| Senior Community Service Employment | 0 | 24,290 | 0 | 23,469 | 0 | 3 |
| Subtotal | 0 | 91,979 | 0 | 88,954 | 0 | 3 |
| Grand total, all programs | 1,441,634 | 2,974,659 | 1,755,593 | 3,600,024 | -18 | -17 |
| Cash receipts distributed to States, counties and Puerto Rico | | | | | | |
| Payments to States and Puerto Rico | 0 | 327,180 | 0 | 372,575 | 0 | -12 |
| Payment to Minnesota | 0 | 1,251 | 0 | 1,302 | 0 | -4 |
| Payments to counties, (National Grasslands and Land Utilization Areas) 6/ | 0 | 1,730 | 0 | 15,347 | 0 | -89 |
| Total | 0 | 330,161 | 0 | 389,224 | 0 | -15 |
| Internal equipment and supply service (Working Capital) | 135,610 | 113,415 | 114,455 | 119,062 | 18 | -5 |
| Reimbursements for work performed for government and others included above | 0 | 103,679 | 0 | 76,848 | 0 | 35 |

1/ Obligations were incurred on a "charged-as-worked" basis.
2/ K-V = Knutson-Vandenberg.
3/ Includes sale of personal property and acquisitions of lands to complete land exchanges.
4/ Receipts not available as a separate item after FY 1987.
5/ Includes Resource Conservation and Development, River Basins, and Pesticide Impact assessment funds transferred from Agricultural Research Service.
6/ Actual disbursement was $5,042,000. Net disbursement of $1,730,000 reflects a refund of $3,312,000 for prior year overpayments.

**Table 63–Statement of receipts--fiscal years 1987-91**

| | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 dollars actual* | | |
| Receipts from sale and use of forest resources | | | | | |
| Timber and forest products | 667,072 | 849,468 | 909,516 | 888,373 | 807,941 |
| Grazing | 11,457 | 10,418 | 10,949 | 8,738 | 8,104 |
| Land uses | 5,011 | 5,008 | 4,508 | 4,472 | 4,394 |
| Recreation | 43,013 | 41,335 | 38,132 | 34,307 | 30,579 |
| Power | 1,144 | 991 | 871 | 824 | 688 |
| Minerals | 43,947 | 64,116 | 86,838 | 43,447 | 46,688 1/ |
| Subtotal | 771,644 | 971,336 | 1,050,814 | 980,161 | 898,394 |
| Receipts from deposits for expenditures on National Forests | | | | | |
| Timber sale area betterment | 197,399 | 206,489 | 241,706 | 238,002 | 196,695 |
| Timber salvage sales | 144,194 | 163,383 | 131,957 | 29,174 | 18,137 |
| Brush disposal | 40,468 | 47,121 | 54,456 | 58,606 | 61,214 |
| Restoration of Forest Service lands and improvements | 140 | 94 | 122 | 80 | 183 |
| Cooperative work | 54,575 | 53,648 | 52,557 | 58,332 | 53,743 |
| Operation and maintenance of quarters | 6,364 | 6,076 | 5,648 | 5,610 | 5,730 |
| Gifts, donations, and bequests | 1,887 | 1,749 | 2,090 | 1,577 | 45 |
| Subtotal | 445,027 | 478,560 | 488,536 | 391,381 | 335,747 |
| Other receipts | | | | | |
| Miscellaneous (sales, rents, etc.) | 8,695 | 5,438 | 8,505 | 9,889 | 11,947 |
| Golden Eagle passports | 6 | 8 | -9 | 23 | 5 |
| Sale of personal property | 0 | 21 | 23 | 3 | 12 |
| Cooperative research 2/ | 0 | 0 | 0 | 0 | 3,581 |
| Royalties from sale of Smokey Bear and Woodsy Owl products | 97 | 115 | 77 | 106 | 87 |
| Acquisition of lands to complete land exchanges | 105 | 13 | 325 | 325 | 385 |
| Gifts, donations, and bequests for forest rangeland research | 31 | 3 | 2 | 3 | 27 |
| Subtotal | 8,934 | 5,598 | 8,923 | 10,349 | 16,044 |

See footnotes at end of table.

**Table 63–Statement of receipts--fiscal years 1987-91--Continued**

| | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *1,000 dollars* | | |
| Other income | | | | | |
| Estimated collections by Department of Energy for power licenses on proclaimed National Forest land | 1,450 | 1,720 | 1,722 | 1,175 | 601 |
| Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land 3/ | 110,000 | 131,000 | 100,300 | 105,700 | 93,400 |
| Value of roads built by timber purchasers applied in lieu of cash payment for timber | 104,579 | 104,864 | 106,541 | 98,002 | 104,263 |
| Subtotal | 216,029 | 237,584 | 208,563 | 204,877 | 198,264 |
| Total | 1,441,634 | 1,693,078 | 1,756,836 | 1,586,768 | 1,448,449 |
| Other net deposits | | | | | |
| Monies advanced on active timber sales 4/ | | | | | |
| Balance from previous year | 238,095 | 260,668 | 253,237 | 247,250 | 219,872 |
| Deposited current year | 1,050,986 | 1,380,031 | 1,397,928 | 1,350,365 | 1,169,636 |
| Transferred to other accounts | -1,079,352 | -1,402,604 | -1,390,497 | -1,344,378 | 1,142,258 |
| Balance on deposit | 209,729 | 238,095 | 260,668 | 253,237 | 247,250 |
| Amounts deposited pending disposition 5/ | | | | | |
| Balance from previous year | 19,296 | 28,351 | 27,610 | 16,492 | 9,396 |
| Deposited current year | 10,593 | -6,393 | 9,609 | 14,790 | 11,943 |
| Transferred to other accounts | -1,844 | -2,662 | -8,868 | -3,672 | -4,847 |
| Balance on deposit | 28,045 | 19,296 | 28,351 | 27,610 | 16,492 |
| Subtotal | 237,774 | 257,391 | 289,019 | 280,847 | 263,742 |
| Total | 1,679,408 | 1,950,469 | 2,045,855 | 1,867,615 | 1,712,191 |

1/ Includes $19 million adjusted windfall profit tax payment for 1980-84.
2/ Not available as a separate item after 1987. Included in Cooperative Work, above.
3/ Oil production figures for FY 87 through FY 90 have been revised due to improved estimating methods.
4/ Timber sale deposits made by timber purchasers.
5/ Budget clearing account.

**Table 64–Statement of receipts--fiscal year 1991**

| | National Forests | Oregon and California grant lands | National Grasslands & L.U. Areas 1/ | Other | Total |
|---|---|---|---|---|---|
| | | | *1,000 dollars* | | |
| Receipts from sale and use of forest resources | | | | | |
| Timber and forest products | 649,801 | 17,241 | 30 | | 667,072 |
| Grazing | 9,754 | 3 | 1,700 | | 11,457 |
| Land uses | 4,740 | 4 | 267 | | 5,011 |
| Recreation | 42,910 | 92 | 11 | | 43,013 |
| Power | 1,134 | 0 | 10 | | 1,144 |
| Minerals | 19,145 | 0 | 24,802 | | 43,947 |
| Subtotal | 727,484 | 17,340 | 26,820 | | 771,644 |
| Receipts from deposits for expenditures on National Forests | | | | | |
| Timber sale area betterment | 197,399 | | | | 197,399 |
| Timber salvage sales | 144,194 | | | | 144,194 |
| Brush disposal | 40,468 | | | | 40,468 |
| Restoration of Forest Service lands and improvements | 140 | | | | 140 |
| Cooperative work | 54,575 | | | | 54,575 |
| Operation and maintenance of quarters | 6,364 | | | | 6,364 |
| Gifts, donations, and bequests | 1,887 | | | | 1,887 |
| Subtotal | 445,027 | | | | 445,027 |
| Other receipts | | | | | |
| Miscellaneous (sales, rents, etc.) | | | | 8,695 | 8,695 |
| Golden Eagle passports | | | | 6 | 6 |
| Royalties from sale of Smokey Bear and Woodsy Owl products | | | | 97 | 97 |
| Acquisition of lands to complete land exchanges | | | | 105 | 105 |
| Gifts, donations, and bequests for forest rangeland research | | | | 31 | 31 |
| Subtotal | | | | 8,934 | 8,934 |

See footnotes at end of table

**Table 64–Statement of receipts--fiscal year 1991--Continued**

| | National Forests | Oregon and California grant lands | National Grasslands & L.U. Areas 1/ | Other | Total |
|---|---|---|---|---|---|
| | | | *1,000 dollars* | | |
| Other income | | | | | |
| Estimated collections by Department of Energy for power licenses on proclaimed National Forest land | 1,450 | | | | 1,450 |
| Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land | 110,000 | | | | 110,000 |
| Value of roads built by timber purchasers in lieu of cash | 104,579 | | | | 104,579 |
| Subtotal | 216,029 | | | | 216,029 |
| Total | 1,388,540 | 17,340 | 26,820 | 8,934 | 1,441,634 |
| Other net deposits | | | | | |
| Monies advanced on active timber sales | | | | | |
| Balance from previous year | 238,095 | | | | 238,095 |
| Deposited current year | 1,050,986 | | | | 1,050,986 |
| Transferred to other accounts | -1,079,352 | | | | -1,079,352 |
| Balance on deposit | 209,729 | | | | 209,729 |
| Amounts deposited pending disposition | | | | | |
| Balance from previous year | 19,296 | | | | 19,296 |
| Deposited current year | 10,593 | | | | 10,593 |
| Transferred to other accounts | -1,844 | | | | -1,844 |
| Balance on deposit | 28,045 | | | | 28,045 |
| Subtotal | 237,774 | | | | 237,774 |
| Grand total | 1,626,314 | 17,340 | 26,820 | 8,934 | 1,679,408 |

1/ Land utilzation projects.
2/ Not available as a separate item after FY 1987. Included in Cooperative Work, above.

Table 65–Statement of obligations--fiscal year 1991 1/

| | Total 2/ | Work for other public agencies (reimbursables) |
|---|---|---|
| | | *1,000 dollars* |
| National Forest System | | |
| Protection and management | 906,518 | 25,125 |
| Fighting forest fires | 132,300 3/ | 12,584 |
| Cooperative work for others | 48,618 | 0 |
| Cooperative law enforcement | 14,054 | 0 |
| Flood prevention and watershed protection | 379 | 0 |
| Restoration of forest lands and improvements | 74 | 0 |
| Reforestation and timber stand improvement 3/ | 99,043 | 0 |
| Timber sale betterment (K-V) 4/ | 225,396 | 0 |
| Brush disposal | 57,609 | 0 |
| Timber salvage sales | 120,334 | 0 |
| Range betterment | 4,490 | 0 |
| Construction of facilities | 57,399 | 11,565 |
| Acquisition of lands, Forest Service | 1,420 | 0 |
| Acquisition of lands, Land and Water Conservation Fund | 64,017 | 0 |
| Construction of forest roads and trails | 186,924 | 662 |
| Timber purchaser roads constructed by the Forest Service | 5,968 | 0 |
| Restoration of roads, Federal Highway funds | 7,154 | 0 |
| Road construction, Mount St. Helens, highway trust | 3,673 | 0 |
| Road and trail maintenance | 27,486 | 0 |
| Tongass Timber Supply Fund | 39,002 | 13 |
| General Administration | 295,858 | 0 |
| Operation and maintenance of quarters | 5,699 | 0 |
| Hazardous waste management | 12,426 | 0 |
| Department of Transportation-Coast Guard | 12 | 0 |
| Resource management timber receipts | 9,317 | 0 |
| Fire protection | 184,451 | 1,233 |
| Early Winters Land Exchange | 497 | 0 |
| Subtotal 2/ | 2,510,120 | 51,184 |
| Research | | |
| Tongass Timber Supply Fund | 1,493 | 0 |
| Forest research | 175,688 | 13,971 |
| Construction of research facilities | 22,575 | 8,158 |
| Cooperative research | 4,106 | 0 |
| Gifts, donations, and bequests for forest and rangeland research | 1,251 | 0 |
| Subtotal 2/ | 205,113 | 22,129 |

See footnotes at end of table.

**Table 65–Statement of obligations--fiscal year 1991--Continued**

| | Total 2/ | Work for other public agencies (reimbursables) |
|---|---|---|
| | | *1,000 dollars* |
| State and Private Forestry | | |
| Cooperation and general forestry assistance | 159,370 | 4,919 |
| Resource conservation and development | 625 | 0 |
| Rural community fire protection grants | 3,353 | 0 |
| River basins | 781 | 0 |
| Flood prevention and watershed planning | 3,125 | 0 |
| Licensee programs - Smokey Bear and Woodsy Owl | -155 | 0 |
| Pesticide Impact Assessment | 348 | 0 |
| Subtotal 2/ | 167,447 | 4,919 |
| Human Resource Programs | | |
| Job Corps | 67,689 | 1,157 |
| Senior Community Service Employment Program | 24,290 | 24,290 |
| Subtotal 2/ | 91,979 | 25,447 |
| Total 2/ | 2,974,659 | 103,679 |
| Internal equipment and supplies service | | |
| Working Capital Fund | 113,415 | 113,415 |
| Grand total 2/ | 3,088,074 | 217,094 |

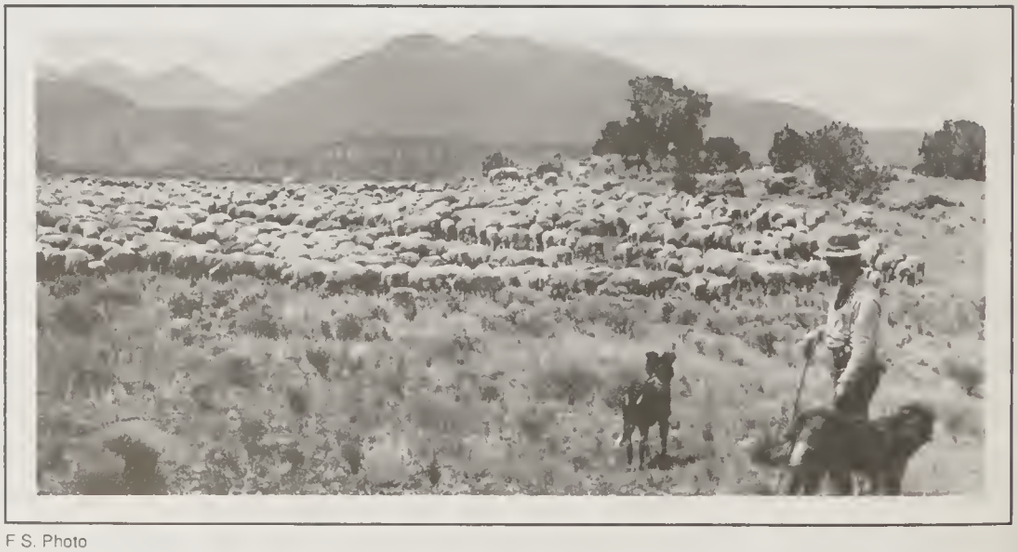
1/ Obligations were incurred on a "charged-as-worked" basis.
2/ May not add due to rounding
3/ Includes obligations of $29,341,004.04 for Reforestation Trust Fund.
4/ K-V = Knutson-Vandenberg Act.


Photo by Jill Bauermeister

Table 66–Statement of obligations--fiscal years 1987-91

| | 1991 | 1990 | 1989 | 1988 | 1987 |
|---|---|---|---|---|---|
| | | | *Million dollars actual* | | |
| National Forest System | 2516.7 | 3,089.7 | 2,747.2 | 2,254.6 | 1,967.9 |
| Forest Research | 205.1 | 163.1 | 153.1 | 153.2 | 143.1 |
| State and Private Forestry | 167.4 | 123.3 | 89.5 | 98.7 | 71.2 |
| Human Resource Programs | 85.4 | 85.5 | 82.9 | 83.4 | 78.1 |
| Working Capital Fund | 113.4 | 114.5 | 118.7 | 102.8 | 90.2 |
| Total | 3,088.0 | 3,576.1 | 3,191.4 | 2,692.7 | 2,350.5 |

F.S. Photo



F S. Photo

**Table 67–Summary statement of values and obligations--fiscal year 1991**

| Item | Units 1/ | Quantity | Average value per unit | Total value |
|---|---|---|---|---|
| | | | | *Million dollars* |
| Value | | | | |
| Minerals 2/ | | | | |
| Common variety | - 3/ | - | - | 70.0 |
| Locatable | - 3/ | - | - | 375.0 |
| Leasable | | | | |
| Oil | BBL | 11,550,000 | 18.80 | 217.0 |
| Gas | MCF | 201,000,000 | 1.45 | 291.5 |
| Coal | Tons | 85,600,000 | 9.00 | 770.4 |
| Others | - 3/ | - | - | 286.0 |
| Timber | MBF | 8,475 | 119.01 4/ | 1,008.6 |
| Recreation | M RVD | 278,849 5/ | 26.10 6/ | 6,391.9 6/ |
| Wilderness and primitive areas | M RVD | 12,784 | 35.62 | 455.4 |
| Wildlife and fish | | | | |
| Recreation | M WFUD | 42,700 | 50.15 | 2,142.0 |
| Commercial | M pounds | 169,000 | 1.04 | 175.8 |
| Range 7/ | M AUM | 9,579 | 6.89 | 66.0 |
| Total value | | | | 12,249.6 |
| Expenditures | | | | |
| National Forest System | | | | 2,516.7 |
| Forest Research | | | | 205.1 |
| State and Private Forestry | | | | 167.4 |
| Human Resource Programs | | | | 85.4 |
| Working Capital Fund | | | | 113.4 |
| Total expenditures | | | | 3,088.0 |
| Net value, total | | | | 9,161.6 |
| Net value, National Forest System only | | | | 9,732.9 |

1/ BBL = barrels; MCF = thousand cubic feet; tons = tons; MBF = thousand board feet; M RVD = thousand recreation visitor days; M pounds = thousand pounds; M AUM = thousand animal unit months; M WFUD = thousand wildlife fish user days; AF = acre feet.
2/ Minerals data estimated.
3/ Units for common variety and locatable minerals are not standard.
4/ Actual value at time of sale.
5/ Includes wilderness, wildlife, and fish.
6/ Average value per unit and total value for M RVD's excludes recreation related M WFUD's and wilderness M RVD's.
7/ Based on permitted to graze animal unit months of forage. Value is a Forest Service-wide weighted average based on maximum ability to pay. Ability to pay reflects income derived by the user from use of the resource.

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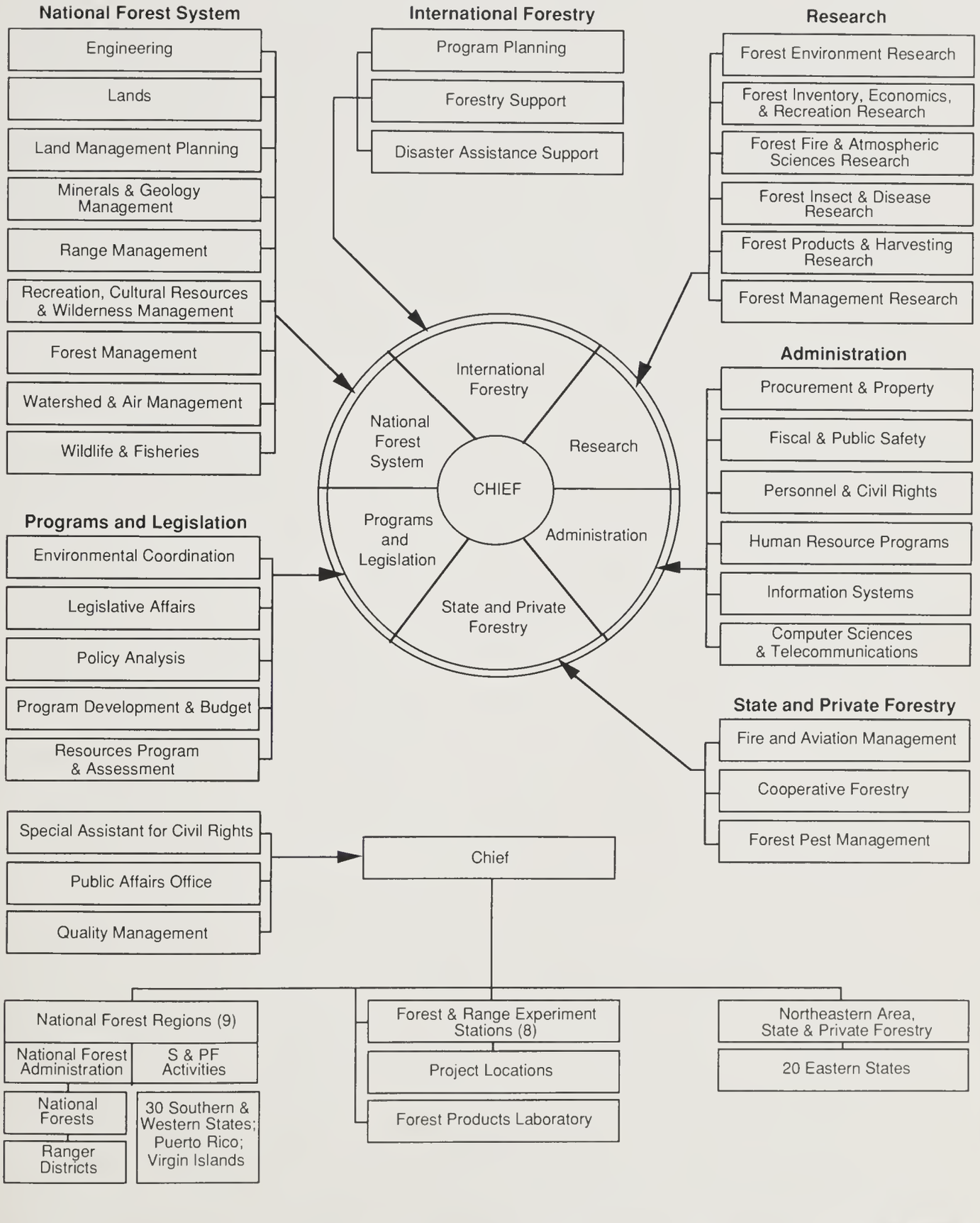


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